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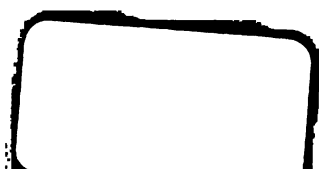
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THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

The Scriptural History of the EARTH and of MANKIND,

COMPARED WITH

THE COSMOGONIES, CHRONOLOGIES, AND ORIGINAL TRADITIONS OF

ANCIENT NATIONS;

AN

ABSTRACT AND REVIEW OF SEVERAL MODERN SYSTEMS;

WITH

An Attempt to Explain Philosophically,

THE MOSAICAL ACCOUNT

OF THE

CREATION AND DELUGE,

And to deduce from this last Event

The Causes of the Actual Structure of the Earth:

IN A SERIES OF LETTERS.

WITH NOTES AND ILLUSTRATIONS.

By *PHILIP HOWARD, Esq.*

Nullius addictus jurare in verba magistri

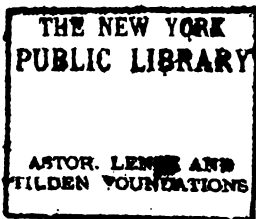
quærere verum.

HORATIUS..

LONDON:

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1797.



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P R E F A C E.

THE substance of the following Work was published in two Letters in the French language towards the end of the year 1786. It has been since revised, corrected, and considerably enlarged. It was originally occasioned by a difference of opinion, relative to the causes of the Formation and Structure of Mountains, between the Marquis de Montigny, much attached to the system of Mr. de Buffon, and the Author, whilst making together a tour through Switzerland. By minds strongly prejudiced in favour of their most celebrated writers, and already agitated by brooding philosophic theories of government, it could be little attended to. In it the English reader will be briefly acquainted with the outlines of those scientific systems, which, keeping pace with numerous publications in every path of literature, were calculated

lated to tear up in the public mind every remaining attachment to Christianity. Should he not approve of the explication here offered of the Mosaical account of the Creation and Deluge, he will at least perceive that those famous systems so triumphantly substituted to it are not a little inconsistent and fallacious. The author's ideas are not, as will be seen, unauthorized by men of high reputation; and if they should in this country of sober reasoning excite the attention of persons of greater abilities to this great subject, his utmost wishes would be accomplished.

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THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER I.

Insufficiency and Contrariety of various modern Systems on the Formation and Structure of the Earth.—Coincidence of antient Traditions with the Scriptural Account of the Creation and Deluge.—Attempt to prove from these, and from the Infancy of Population in Times not very remote, the Reality of a general Deluge, and its Antiquity not far removed beyond the Date usually assigned to it.

SIR,

IN the agreeable tour we made together in Switzerland, the aspect of its mountains stretching on all sides range behind range, pile over pile, in vast and rude magnificence; the various and often singular disposition of their strata; the frequent marks of ruin and

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dislocation visible on their shattered flanks; the correspondent angles of the rocks bordering their vallies, apparently excavated by torrents which could bear no proportion to their present scanty rills, gave occasion to ruminate on their original formation, and the convulsions which they must have since experienced. Our reflections on these objects frequently led us to converse on the formation and revolutions of the earth itself. As we sailed along the frequent lakes of this wonderful country, the undoubted marks of wave-worn rocks on their opposite sides, many toises above the present level of their waters and much above their possible reach, shewed us plainly that those immense cavities had once been filled with them to a much greater height. This circumstance strongly connected the changes wrought in these high regions with those which must have consequently happened on the lower surface of adjacent countries. The multiplicity of these objects, whilst it afforded constant materials for new reflections, gave us little time for discussion; and we then mutually promised each other to communicate our ideas more at leisure on these interesting and difficult subjects, on which are daily built so many different systems. I am far, I own, from possessing all the various parts of science which would be requisite to treat this subject as it deserves; but from the perusal of antient history, from the writings of others, and the reflections which their various systems have suggested, as well as from my own observations, I have framed to myself some ideas, which in consequence of my promise I shall venture to communicate, in hopes
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at least that it may engage you at some time to comply with yours.

I must confess that I have yet met with no system amongst the vaunted philosophers of your nation which appears to me satisfactory. Their several authors labour to account for the whole order and disorder which appear in our planet (for both are strongly marked) by one single elementary cause operating during an infinity of ages. In consequence of this predilection for a single agent, whether fire or water, they frequently see their systems exposed to embarrassing dilemmas, or overturned by contradictory facts.

I should rather think that it is by admitting several co-operating or successive causes, that we may at length form some plausible idea of the original formation of the present structure of our globe, and of the revolutions which must have occasioned its actual dislocated state. I say plausible, because I think natural philosophy, whatever progress it has made, yet too far from that perfection of which it may be capable, to afford any thing very decisive on the subject. That it ever will be able to attain any thing like certainty, is much to be doubted.

Almost all the authors of these new systems, to conduct the works of Nature to their present state, require an almost infinite series of ages. Great alterations operated by a general deluge are

industriously excluded. Revolutions they admit ; but a sudden and total one would not favour the gradual and slow workings of their plastic Nature, and might have effaced all traces of those ingenious processes which they have devised for her all-efficient power. Yet the most authentic records of man, the slow population of the earth, and the birth and progress of the most necessary arts clearly specified in the annals of all nations, tell us, with at least equal authority, that this earth, since its last great revolution, cannot be, as the habitation of the present race, much older than the age most generally assigned to it. I own indeed that the antient story of several nations furnishes many with reasons for giving a much longer duration to the present state of things ; whilst others, perceiving nothing but doubt and monstrous fables in its whole texture, entirely reject the testimony of history. Some persons, attributing to certain still existing monuments an antiquity far beyond the reach of record, persuade themselves that on this globe, whose origin and great successive changes are by length of time enveloped in utter darkness, ignorance and knowledge have frequently succeeded each other at several intervals, as has happened between the age of Augustus and that wherein we live, and thus presume an antiquity unaccounted for in the existing annals of mankind.

Philosophers, rejecting every other document, pique themselves on interrogating Nature only ; and from her pretended certain indications pronounce, in spite of human annals, her high antiquity in-

dubitable. But if in some points that Nature has permitted her secrets to be penetrated by their sagacity, in others she has certainly withheld them ; and the responses she is pretended to have made through their channel, on the great assemblage of her operations and structure, appear as yet not a little uncertain and confused. There is yet ample field for disquisition, where the variability of opinions, however authoritatively affirmed, shew truth uncertain, if not undiscovered. The hitherto discordant oracles of philosophy seem not therefore of sufficient weight to overbalance the general traditions of all nations and ages on those points wherein they are found to coincide.

It must be allowed that the history of early times, interrupted (*a*), broken, disfigured, and obscured by absurd fables, presents more uncertainties than facts on which we can rely. It is a shadow almost effaced, but which still proves the existence of a real body. The vanity of nations and of authors has nearly buried it under a heap of apocryphal tales. The physical properties of nature and of the seasons, and the history of the labours appropriated to these, blended with the names and actions of the first instructors of mankind, form allegorical and mysterious fables, which produce to us a chaos scarcely to be penetrated. In consequence, the greatest part of those facts which they were meant to convey to posterity, are and will remain covered by a thick veil not to be removed. But, amidst all this darkness, persevering criticism still discerns from time to time some principal events,

events, which ever appearing prominent in the history, the fables and mysteries of all nations indicate the real vestiges of certain truths of which all had equally preserved some idea.

Almost every considerable tribe into which mankind has been divided, has been ambitious of that sort of pre-eminence which higher antiquity, and the honour of having invented or perfected the arts, seem to bestow. But notwithstanding all their efforts, the obscurity and evident fallacy of their annals beyond a certain age, the thinness of population, the tardy birth and slow progress of the most necessary arts in those very regions in times not very remote, the successive emigrations at much later periods of feeble colonies (*b*) into fertile and in aftertimes celebrated countries, then nearly uninhabited, shew the commencement or renovation of the human species not very far distant. If the early perfection of certain arts point out in the minds of some persons a much higher antiquity, we may observe to them in one great nation several of those arts emerging from a state of barbarism to an astonishing height of perfection in the space of a century or two. This will clearly prove that the coincidence of fortunate circumstances, and of a few happy geniuses which met in those countries, had given them an energetic growth which no number of ages has been able to produce in others. Epic and tragic poetry scarcely experienced any infancy. Homer immediately elevated the former, and Sophocles shortly raised the latter to full maturity. It is certain that the immediate predecessors

of Praxiteles and Apelles found sculpture and painting as rude and destitute of grace and nature in Greece, as those of Michael Angelo and Raphael did afterwards in Italy. The successors of those sublime artists in either country, far from surpassing, have not even equalled them. The perfection of the fine arts follows not then the number of years or ages, and it is not from their state we are to deduce the antiquity of nations (*c*).

Astronomy alone seems to have a claim to an antiquity beyond the reach of record. In times absolutely unknown the theoretical part seems to have been perfectly understood. Its practical rules, preserved from time immemorial by some eastern nations without the knowledge of the principles on which they are founded, shew it to have been inherited a mere skeleton of science from a former race with whom its theory had perished. Whilst such was its fate in the east, the principles of that sublime science were re-discovered in much more recent times by a new nation, till then equally ignorant of practice and of theory.

The foundations on which certain nations have endeavoured to support their pretensions to unbounded antiquity, fall of themselves, in the eye of criticism, from the moment they are obliged to have recourse beyond certain epochs to the existence of gods or other imaginary beings. The felicity depicted during the reigns of gods and demigods denotes indeed the remembrance of a once happier

pier state of mankind. The termination of these golden ages, nearly coinciding, as if by consent, in the annals of those nations, with the probable date of the deluge, bears testimony to the recency of that great event commemorated in the traditions of almost all ages and countries. That its date is really not far removed in antiquity, I think a critical though cursory investigation of history will evidently confirm.

From a general but rapid review of the traditions, of the chronology, and of the early state of antient nations, I shall endeavour to select such facts as by their universality bid fairest to be authentic. These few consentaneous points, forming the most striking features of almost every national record, we shall find concurring to establish the truth of a general deluge, and of the subsequent renovation of the human race at no very distant period. To what distance its date may reasonably be removed shall be fairly discussed. That, from the partial histories of some nations, others have inferred a much higher antiquity than I am willing to allow, will not be disguised. The pretensions of certain people to very remote origins, I flatter myself, I shall be able clearly to shew destitute of every motive of credibility. Founded on national vanity, and on the supposed succession of princes who were either allegorical personages mistaken for real, or, if real mortals, were by the gratitude of posterity adorned with the longevity and other attributes as well as with the names of their deities (*d*), they scarcely claim a place in history. The extravagant

STRUCTURE OF THIS GLOBE.

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travagant dates of such reigns are either reduced to their just value, or vanish before sober criticism. On a subject so intricate you will pardon me, Sir, if I attend more to plain discussion than to elegance of style.

In seeking to penetrate into the chaos of antient history innumerable difficulties occur, which have at all times sufficiently exercised the critics. To say the truth, almost impenetrable darkness surrounds it, and we must frequently seek our way to truth by the faintest glimmerings of light. Such however appear from time to time, and, if kept steadily in view, may at length bring us to some degree of probability. Wherever these happen to concentrate, they will form stations which may guide us through surrounding darkness. The allegorical genius and the exalted imaginations of the orientals, but above all the interests of mythology, have enveloped a few real facts in mysterious fables, absurd if literally understood, but frequently concealing natural or moral truths. In their hands, the rude elements of which this world is composed were clothed with the characters of parent divinities. The successive order in which they appeared or acted at the first creation constitutes the successive generations of these ideal beings. With the consummation of the work finishes the very existence of these symbolical gods. Old Chaos and Erebus totally disappear, and are no more heard of, to give place to a new set of deities. Nature completed furnishes them abundantly. In every region pa-

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ganism had deified the sun, moon, earth, and other known planets: with these were joined fire, water, and air, the god of the inferior regions, and the goddesses of wisdom, to make up the circle of the twelve greater gods. These, the most obvious objects of veneration, were successively, as truth wore out, adopted by every nation, and their pretended histories incorporated with its annals (*c*). According to the qualities under which they were considered, or their influence particularly wanted, they were adored in divers countries under different names, and even sometimes in the same country under different appellations. The sun, as the most beautiful, the most grand and most exalted of beings, was called Bel, Baal, and Adonis in Chaldea: with reference to his strength and power, he took the name of Hercules, at Tyre: as the sovereign fecundating virtue, Osiris represented him in Egypt: as ripening the vintage, he was sometimes confounded with Bacchus: as leader of the celestial harmony, he took the name of Apollo, in Greece. The moon, as queen of the heavens, was styled Astarte, and under her different aspects or attributes took the names of Isis, of Diana, or Latona. Each of these gods had his genealogy and his history, and his attributes became at length so many secondary divinities. Mountains, woods, and rivers peopled the whole earth with demigods. The genii of the seasons, and their various labours allegorized, increased the celestial court; and their effects and processes, transformed into facts and actions, soon furnished the detailed history of these imaginary beings. Mr. Court de Gebelin has most ingeniously shewn to a degree

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of evidence, that the whole history of Saturn, given us by Sanconiathe, is no other than an allegory of husbandry and its labours, repeated under other points of view in the labours of Hercules (*f*).

Unfortunately for true history, many nations prodigally bestowed on their founders and benefactors, or on the inventors of the arts, the titles of their deities. The sun and moon, from the benefits derived from them, became gods; and for the same reasons the first progenitors and settlers of nations were at first honoured as their representatives on earth, and through lapse of time became identified in persons as well as names with their prototypes. In consequence of this, allegorical actions relative to the surnames they had acquired, intermixed with such as were really proper to these deified mortals, were attributed not to one only, but to several true personages, who lived in ages and countries very remote. When the genealogies and histories of these deities came to be made out and collected, all those scattered anecdotes were attributed to one and the same god. Thus a multiplicity of Herculeſes of various ages and regions were confounded into one. Herodotus hesitates not to say, that the Greeks, in adopting the Egyptian deities, had invested with their titles mere mortals of very recent date. This stands confirmed by other pagan authors; and it is well known that the sepulchre of the Cretan Jupiter was shewn long after this historian.

Chronology suffered still more from this strange mixture and con-

fusion of fictive and real personages and actions. The dates of true events have become indeterminable; and the vanity of nations, all contending for pre-eminence in antiquity, has rendered them still more embarrassed and uncertain. In addition to the mischief, other difficulties of another kind also occur. In very early antiquity the measure of the year varied extremely in different countries, and has often changed amongst the same people at different times. We find established years of one and of fifteen days; of one, of three, of four, and of six months; years of 360 days, lunar and solar years (*g*). Here, chronology seems to determine precise dates to events which prove entirely fictive; and there, when the facts appear real, we are reduced to guess to what kind of year belong the dates which are assigned to them. One thing only most generally appears, that the higher we rise in antiquity, so much shorter we must reckon the duration of the years that are spoken of in its annals. Unequal to calculate the solar year with precision, men had first recourse to the diurnal revolutions of light and darkness, and afterwards to the most remarkable phases of the moon: from these, lunar and at last solar years were inexactly computed. Thoroughly to discuss these intricate points would both be above my strength and beyond my purposes. I shall confine myself to the extracting from this confused mass those remarkable events, which appearing every where prominent in the traditions of every nation, thence acquire a real authenticity as fundamental points of universal history; and to the offering a few dates, too high removed perhaps, but which become so much the less

less objectionable as they will be furnished by a hand not to be suspected of partiality to my opinion.

A notion of the existence of certain beings superior and anterior to the human race seems to have been common to all people. The Egyptians, the Chaldeans, the Phœnicians speak of the reigns of the gods and demigods, of the children of the sun and of the moon. The Chinese pretend that men were preceded by the families of the heavens and of the earth. The Persians say that, before the creation of Adam, God had created the Dives and the Peris. The Indians occupy their two first ages by a succession of gods and of Pidar devata. Their last kings and their still existing rajahs call themselves of the race of the sun, or of the moon. The creation of these superior beings, as well as that of men and of the whole universe, seems to have been very generally at first attributed to one supreme God. As embracing all visible nature, the names of Cœlum, of Uranus, of Tien, were frequently given to him. From thence the transition was easy, and one cannot be surprised that nations plunged in corruption and ignorance should at length identify him with nature. The idea of a spiritual invisible divinity was gradually lost. The first philosophers of Greece endeavoured to account for all things without the interference of an intelligent architect, and the opinion of the existence of such was revived with diffidence by its latter and more sublime fables (*b*). The primary existence of a chaos, or of the confused elements of this world—its gradual reduction into order—original darkness,

darkness, from whence issued light—the division of waters, which at first covered the whole surface of the earth—the successive formation of fish and birds, of terrestrial animals, and finally of man, are recorded in the mythologies and traditions of all ancient nations. The ancient Etruscans and the Persians held, and the modern Persians still profess, one supreme God, to whom is attributed the creation of all visible things in six distinct periods (*i*). All the most essential circumstances related of the creation in Genesis are to be found dispersed in some one or other of the ancient cosmogonies of various nations. Nothing can surely more clearly prove a common source of belief, variously altered or corrupted, but not entirely lost. A state and age anterior and more happy, from whence man is fallen; the superiority of the first men to us, both in vigour and longevity, are ideas preserved in all nations. The precise number of ten generations, reckoned by the Jewish legislator between the creation and the deluge, is repeated in the annals of the most distant countries. The Chinese compute ten generations from Fohi to Yu, who appears at the head of their first dynasty. The Persians enumerate the same number from Soliman Haki to Caicobad, the author of their second race. Sanconiatho, a Phrygian, reckons ten generations of gods or demigods between Uranus and the present race of mortals. Berosus, a Chaldean, counts the same number before a general deluge. The Egyptians give the like number to the Atlantides before that epoch. The Tartars and Arabs, nations famed for their simplicity and for their attachment to their genealogies and antique traditions,

ditions, preserve not only the memory of these ten generations, but in concert, though separated by immense distances, give to most of the antediluvian patriarchs, as well as to their immediate successors, the very names consecrated to them by Genesis.

The conformity of this last with the traditions of these two distant nations, and the frequent and strongly marked coincidence which we must have already observed between the facts announced in it and those which are reported to us by all these antique chronicles, cannot but rouse our curiosity to the particular consideration of a book certainly the most antient that time has preserved.

In making the review of antient authors we cannot refuse to Moses, who precedes them all, a particular attention. Abstractedly from every idea of inspiration, no unprejudiced person, who has not a partial system to support, can dispense himself from allowing him a certain deference purely as an historian relating the tradition of his age (*k*). His writings have been transmitted to us in an integrity without example. The ingenuous simplicity of his style gives him an air of candour and of truth. It is not to posterity alone, nor to a few confidential or learned persons, these writings are configned: they are publicly read during the author's life to a whole people; and in them he frequently appeals to monuments well known to and under the eyes of that people. The age in which he lived coincides with times in which, as we shall soon observe, our Europe was as yet

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very thinly inhabited by a few barbarous and wandering tribes, and in which, even on the shores of Asia somewhat removed from the centre, very small states were either yet unsettled, or were in early infancy. That age then approaches to times when mankind was as yet few in number. He carefully enumerates the generations which had preceded him up to the event which must have caused that paucity. This limited and restricted population, which all history shews as extending itself very slowly in several succeeding ages on the greatest part of the globe, must evidently have been occasioned either by the revolution he describes, or by some such event, the date of which could not in his time be very far removed. All the general facts of which he speaks are confirmed by, or connected with, the constant and uncommunicated traditions of every people on earth; and particularly agree with such as, like his accounts, are confined to a small number of simple facts. What attestation more authentic than that which is given by the general result of all antient traditions? The more we examine Genesis, the more we are forced to allow that it seems to be the focus from which proceed, or in which concentrate, all antient truths scattered over the face of the earth. If some antient people talk to us of certain beings who preceded man, of gods, of demigods, of sons of the sun or of the moon, of genii and fairies (imaginary existences which reason obliges us to reject), we find in the recital of Moses the origin, explication, and correction of those fables. Angels of a superior nature created before this earth—a generation of antediluvians, whose longevity

gevity and vigour of body far surpassed those of the present race of men—the distinction of these into good and bad by the allegorical denomination of children of God and children of men—indicate the sources from whence a love for the marvellous drew these extravagant ideas. If almost all annals retrace to us ten generations preceding a general destruction by the deluge, in his history we observe their exact filiation and the number of their years ; and we remark two singular people, as yet existing in their primitive state, agreeing with him in the names of many of their chiefs. If the unanimous voice of all nations announces to us an universal deluge, it is in his writings that we find its regular history ; the particulars of which are to be found scattered in the mutilated accounts of other historians. He names the small number of persons who escaped from it ; and most nations claim them to be their first progenitors. He enumerates the chiefs of the principal races who divided the earth amongst them ; and the formal avowal, and the very names, of the most antient people who have existed, or who yet exist in a national body, confirm his veracity on every point which has escaped the ravages of time.

In effect, in common with the Jews, who yet exist in so extraordinary a manner, dispersed but not mixed, all nations have retained more or less the memory of that deluge which terminated those ten generations of which we have spoken ; but the Tartars and Arabs have preserved to those who escaped from it, and to several of their posterity, the identical names which Moses gives them. These two

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nations certainly deserve a particular distinction. From their bosom they have sent out conquerors to invade the rest of the earth; but they are the only people who, as nations, have kept unvaried possession of their antient habitations, and have there ever maintained their independence: these, like the Jews, have preserved their races unmixed, retained their antient manners and traditions, and like them they are singularly attached to the preservation of their genealogies. When these traditions, and more particularly those of the Tartars, separated by an immense distance from, and never having had any communication with Judea, are found to agree with each other and with the Jewish records, it must be owned they give a very singular sanction to these last. The principal Tartars, or more properly Tatars, declare themselves descended from Turk, or Turgoma, son of Japhet son of Noah, who was saved from the deluge in the ark, on mount Ararat, the mountain of Baris, or of the Ark. They more usually call themselves Turks, or Turcomans, than Tatars, which belongs to a collateral line: they acknowledge in their country, or its neighbourhood, particular races descended from Gog and Magog, names well known to the whole east under the varied pronunciations of Gin and Magin, Tchin and Matchin: from these the Chinese descend, and as yet bear their names. It should seem that the name of Goth, so famed in the west, is also another variation of the same original appellation. All the Celtic nations are derived from Gomer: and the Welch, one of their branches, who as yet speak their language, call that language Gomraag, and themselves Gomerai. All the antient inhabitants of Europe claimed Japhet as their first father;

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as is attested by the Latin proverb, *Japeto vetustior*, and by the *Audax Japeti genus* of Horace. Ethiopian is a simple translation of Chushite. The capital of Egypt is yet called Mefr, from Mefraim, by its inhabitants; and the name of Egypt is a variation of Ai-caphtor, the island of Caphtor, from whence its old inhabitants are yet called Cophts. The Russians and Muscovites, whose frozen climates have never invited conquerors to come and change their names, derive them visibly from Rofs and Mosoch (*l*). Considering the variation of languages, and the frequent changes of habitation, one cannot hope to find, after so many ages elapsed, this singular conformity but in nations either very antient or long sequestered from all others. It is sufficient that this occurs wherever those circumstances are found, and that some traces of it remain in all antient languages spoken even by people very far removed from their antient stocks and seats. But the great event of the deluge, acknowledged effect of the divine wrath, is consecrated by the traditions of every nation in every corner of the earth, even by those of America, though probably the last peopled region. The fact of the restorer of mankind, not unknown to profane authors under his Hebrew name, or such as are evidently slight deviations from it, saved from the waters in a ship (*m*), is repeated by all nations from China to the shores of the Mediterranean and Baltic seas. The sacred books and mysteries, and the most solemn religious ceremonies of antiquity, recalled the memory of that catastrophe. In each of the respective annals of all antient nations we find some circumstances, and from a review of them all we may collect every article, of the Mosaic account of the

deluge, from the entrance into the ark to the dispersion of mankind. The minute circumstance of birds sent out by Noah whilst yet in the ark, is not forgotten even in Peruvian story (*n*). The very variety of fables to which these incidents are accommodated shews them to be uncommunicated fragments of original tradition. As well as the Hebrews, the Arabs and Tartars land the ark on mount Ararat (*o*), whatever particular spot of the mountains which environ Armenia may be designed by that name. In fine, the agreement, by general acclamation, in all ages, of all nations, divided in languages, religion and manners, and separated by immense tracts of sea or land, in the tradition of one singular and awful event, which must have long remained deeply graven on the minds of men, is surely the most complete proof that was ever given of an historical fact.

Here then is one great and important event, which, attested by the unanimous consent of nations, can no longer admit of reasonable doubt. It remains to determine its date by approximation, not indeed within a few ages, but within limits in which an age or two more or less may not be of great consequence on an object so distant from us. The combined result of the most authentic traditions, and the consequences which may come out from the review and state of nations in times somewhat better known, are the sole means which reason points out to attain it.

I shall not enter here into a minute discussion of the first era of the existence of man, nor even on that of the deluge: they are too uncertain

certain to pretend to fix them with confidence. It suffices for my purpose to prove that these events, and particularly the last, cannot be carried up to an antiquity infinitely remote. The result of the opinions most generally received amongst all nations determines the first within 6500 years, and the second within 4000 years before the Christian era. If some nations, ambitious of very high antiquity, have carried still higher the origin of the world, let us remark, that it is no longer for the habitation of man, but for that of beings unknown to and rejected by reason. Even from the duration which they give to the human race much must be deducted, on account of years very different from ours. The greatest difficulty arises from the circumstance that these years, varying from 365 days to 24 hours, being no where accurately distinguished in profane chronology, can never be applied with certainty to any period. A few words escaped from several authors, alone give room to make now and then the distinction. Neither must we dissemble, that in the divers versions of Genesis a very considerable variation is found in their chronology on the distance of time, both before the deluge and after it, to the birth of Abraham : it is not occasioned, however, by any difference in the computation of the years, nor by any discordancy in the facts, but purely results from some mistakes of some letters or cyphers denoting the ages of certain patriarchs at the birth of their sons. I shall perhaps have occasion to speak of it hereafter. To escape from this labyrinth of difficulties we shall suffer ourselves to be implicitly conducted by the judicious and not to be suspected labours of Mr.

Bailly,

Bailly, a man of great learning, celebrated for his researches into early antiquity (*p*). Since the publication of his system, which I shall particularly combat in my second letter, a system which requires a succession, uninterrupted by any great revolution of the earth, not of 4000, but of at least 30,000 years, he has given to the public another work on the astronomy of the Indians. His principal aim in this is to establish an epocha of 3104 years before Christ, founded upon real observations of the heavens. In a preliminary discourse he considers the whole succession of Indian ages; and to confirm this favourite epoch he reviews and weighs the chronologies of all other antient nations. Whatever may be his ultimate design, one cannot refuse just praises to an arduous work of real merit and true value, contracted with great ingenuity into a small compass. In this the sagacious author modifies the duration of the four ages of the Bramins (*q*). Abandoning to fable, or reserving to future interpretation, the two first, he reduces to a very moderate computation the long supposed duration of the third age. He conjectures, that the years of this age are really to be resolved into so many days; and proves it by a passage of the Begavedam itself. Thus reduced, this age, including the interval reckoned by the Indians between the third and fourth age, contains about 2400 solar years. By similar operations, which he esteems suitable to the divers methods of estimating time in this very high antiquity amongst other nations, he reduces their several chronologies to a tolerably near conformity with the duration which he has given to this third Indian age. It

was during this period, say the Indians, that the first men appeared upon earth; and Mr. Bailly decides, that it comprehends the times which, according to us, elapsed between the creation and the deluge. The result of these learned researches is, that the length of this period, according to the corrected supputation of these several nations, turns out as follows:

	<i>Years.</i>
According to the seventy interpreters of the Old Testament it contains (r) - - - - -	2256
According to the Chaldeans (s) - - - - -	2222
According to the Egyptians, 30,000 years reign of the sun taken for days, - - - - -	2342
According to the Persians, the reigns of the Peris, - - - - -	2000
According to the Indians, including the interval between the third and fourth age, - - - - -	2400
According to the same, calculation of seventy-eight generations at thirty years each, - - - - -	2340

Though the Hebrew text of Genesis gives only 1656 years for the interval between the creation and the deluge, we here see at least the antediluvian times reduced by Mr. Bailly himself, from the confrontation and moderate evaluation of the most antient chronologies, to a term of between 2000 and 2400 years. Let us now proceed to a period more interesting to us, the times elapsed between that event and the Christian era. Here follows the result of the enquiries of the same ingenious author:

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The Persian empire, from the birth of Caiamurath, comprehends (<i>t</i>)	- - - -	3547
The reigns of men in Egypt, according to Manetho (<i>u</i>),		3901
The 11340 years of Herodotus from the reign of Menes to that of Sethon, taken for years of Horus, added to the time between this last and the Christian era (<i>w</i>),	-	3545
From the deluge, according to George of Trebifond,	-	3734
From the Indian epoch of the present age, added to the interval of 400 years, by which Mr. Bailly thinks convenient to increase its duration (<i>x</i>),	- - -	3501
From that epoch, according to the Indians themselves happening after a deluge, and commencing the present age,	- - - -	3101
From the deluge, according to the Septuagint version,	-	3299
The genealogy of the kings of Dehly, according to Mr. d'Anquetil and father Tieffenthaler (<i>y</i>),	- -	3188
The genealogy of the kings of Cachemire (<i>z</i>),	-	3215
From the deluge, by the Samaritan calculation,	- -	2998
From the first commencement of the Chinese empire by Fohi, and the first existence of men (<i>aa</i>),	- -	2953
From the foundation of Tyre, according to Herodotus,		2783

I shall not dissemble, that according to my opinion several centuries must still be defalcated from all of these supputations: but should we even not contest calculations so apparently uncertain, we have

have here an estimation of the times elapsed between the deluge and Jesus Christ, by an author who cannot be suspected of a desire of shortening them, which in no instance reaches to 4000 years, and on a medium of all these calculations does not produce 3500.

Other means still remain of determining whether, in fact, the epocha of the deluge should be carried higher or brought lower. These are, the examination of the events which are pretended to fill up the spaces of this high antiquity, and of the personages who appear to occupy the first ages of these chronologies; but above all the state, progress, and establishment of nations, and a general review of the state of the world in times more recent and consequently better known. From these we may regulate our judgment on the more or less considerable antiquity which may reasonably be allowed to an event which, having reduced the human race to a very small number, must have nearly produced the effect of a recent creation. In default of more authentic monuments, the gradual population and the progressive occupation of the earth at different epochas will furnish the most probable indications of its date within a few hundred years.

It is evident that the imaginary reigns of the sun and moon, of the gods and demigods, are either entirely ideal or relate to the antediluvian world. If they ought not to be entirely rejected, at least

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by the avowal of Mr. Bailly, and as appears by several passages of antient authors, the calculation of their years must be greatly curtailed by reducing them to diurnal revolutions of the earth. Even since the commencement of the reigns of mortals, which in general may be supposed to relate to the times elapsed since the deluge, that author agrees that years of twenty-eight days and of three months must be sometimes applied to several periods of these antient chronologies. It appears that years of 60 and of 180 days were also in use in this high antiquity; and consequently it is more than possible that even in times not quite so remote reductions will be still necessary to be made, in order to bring their calculations to our present standard. To distinguish with precision when these different measures of time are applicable, is impossible. When pressed by men of learning, the Egyptian priests have sometimes unveiled part of their secret; but to the vulgar they still maintained the whole series of years comprehended in their computations to have been really solar years. To fill up this long succession of ages by a list of generations which might answer to it, they, as Sir John Marsham and Sir Isaac Newton wisely conjecture, placed in succession as reigning over all Egypt the catalogue of petty kings, who after the time of Moses, either from divisions or partial conquests, or from the general usage of those times, when population became extended, reigned at the same time over divers parts of the country, at Coptos, Thebes, This, or Elephantis in the higher Egypt, and over other districts of the lower, until again re-united into one kingdom under Misphragmutosis, most probably.

bably in the thirteenth century before Christ (*bb*). The pretended annals of these antient times, composed of a list of names without facts, or with the same facts repeated, shew this to evidence. Without even giving themselves so much trouble, they often invented imaginary successions of kings. The statues of 330 kings and of 330 high priests shewn to (*cc*) Herodotus in the temple of Memphis, many of whom must have existed long before Memphis itself was built, clearly prove how anxious they were to perpetuate their falsehoods. The first of these tricks seems also to have been exercised by the Chinese chronologers. For some time it was the fashion to expatiate on the high antiquity of that nation. The first missionaries, willing to exalt the glory and importance of a people whom they first brought to the knowledge of Europeans, and who had received them with such distinction, contributed, from self-vanity (*dd*), to give credit to fables rejected by the learned of the country itself, who agree that the only part of their history to which any confidence can be given rises no higher than some ages before Confucius, who lived 550 years before Christ; that is to say, as late as with us (*ee*). I will even venture to assert, that, excepting what relates to that morality which is engraven in the hearts of all men of all ages, the subject matter of the writings of this celebrated philosopher, as well as his annals, shews an age and country very little enlightened. There is even a greater uncertainty in the history of this than of any other people. All their antient annals, without excepting those of Confucius, doomed to destruction by the emperor Chihoangti 213

years before Christ, were patched together 73 years after, by order of Vu-ti, from remnants of mutilated and dispersed copies, or from the memory of the few learned men who could survive that long interval; or rather from the traditions preserved by their children. For this reason the authors of the *Kangmo*, or great annals of the empire, the most esteemed historiographers of that nation, fix the commencement of their truly authentic history and certain chronology to three or four centuries before Christ. Mr. Sale, one of the most learned co-operators in the antient universal history, and, since that, Mr. De Guignes, both of them truly learned in the oriental languages, have drawn from the text itself of the more antient pretended annals of China the most complete proofs of their falsity. In these chronicles it is said, that one of their kings first drew men from caves and hollow trees to inhabit huts made of reeds, and first substituted corn to wild fruits and acorns. Some of his successors are cited as the inventors of the first rude arts, gradually perfected under a long list of kings, without other facts. Several ages after, comes another king who again draws men from caverns, followed by other successors who again invent the same arts. From hence we may boldly conclude, that, like the Egyptians, the Chinese have placed in succession as reigning over the whole country the several dynasties of petty princes reigning independent at the same time in different parts of the country, though paying homage, as was the case in Ireland, to a chief king, whose family, either from supposed pre-eminence or from election, was looked upon in the same light.

as the present emperors of Germany are by their co-estates. In the time of Confucius the northern parts of that country were still divided into several sovereignties, and the south part of it, as it should seem, partly as yet under water, and very thinly inhabited (*ff*). He was himself the subject of one of these petty kings, subordinate to the king of northern China. In his chronicle he gives a dry list of antient kings, but looks upon history preceding an epocha which does not reach to the days of Moses, as uncertain and fabulous (*gg*). No reliance is therefore to be placed on the chronology of that history; and it is easily to be perceived, that all antient traditions are therein much confused and embarrassed. Fohi is often there taken for the first man, and as often seems rather to represent Noah. That part of the history which seems less tainted with fables begins only with the dynasty, always distinguished by the title of The First Dynasty, which commences with the emperor Yu 2217 years before Christ. This indeed may very probably be the era of the first establishment of a colony in China under some of the descendants of Noah. Those authors who have been the most prone to exalt the antient splendour of that nation yet agree, that in the time of this last-named emperor the Chinese occupied only four provinces on the north-west of the empire. It was in his reign, say they, that several provinces to the south were discovered, into which colonies were sent. It was under his successors of this first dynasty, called Hia, which lasted 458 years, that the Chinese became more numerous, extended themselves to the east, draining and defending successively by dikes from the waters,

ters, which till then overflowed and covered them, the several provinces of Kian-nan and of Tche-Kiang. Nothing can better prove the very recent origin of that monarchy, thus gradually spreading itself over six only of its most northern provinces in the sufficiently long period of between four and five centuries. It would be fastidious to dwell on the annals and chronology of other nations, in which would be found reasons no less cogent to restrict them within very moderate bounds. I am inclined to think one general circumstance contributed much to extend the accounts of them all. Every nation is descended from the chief of the family which was saved from the deluge. Equally ambitious of high antiquity, each has very naturally taken the birth of this common father for the remote date of their origin; and by this means the 600 years of Noah before the flood are every where added to the times elapsed after it. I conjecture even, that this is the origin of the length of years reckoned by the Septuagint before Abraham. One may perceive how easily such double entries slip into a long account, from Mr. Bailly's having, as already observed, given us a flagrant example of it. From all these considerations it will surely appear probable, that, far from extending the antiquity of those chronicles furnished us by that gentleman, much on the contrary may be discounted from the number of ages he has thought proper to allow them. The state of all nations then known on the earth, at periods more recent and furnishing somewhat more authentic documents, will, I believe, confirm this supposition.

In this high antiquity the historical page, full of doubts and contradictions with respect to events supposed to have taken place in Asia and Egypt, absolutely silent as to those which may have passed in other parts of the world, shews us very explicitly, even admitting the exactitude of antient chronology, that the finest climates of our Europe, as well as the opposite fertile coasts of Asia and Africa, as yet in the state of wild nature, were either uninhabited, or contained only a few scattered families of roving barbarians, 2100 years before Christ. The neighbouring coasts of Greece and Phrygia are the only parts of those immense tracts whose first colonization it ventures to indicate as having taken place at several distant epochs subsequent to that period. Of the population of the northern and interior parts of Europe in those times no account is given. From hence we may fairly infer that it either began much later, or from local circumstances was much more slow. From all these premises nothing appears more evident than that men spread themselves slowly and gradually to the west from the banks of the Euphrates and Tigris, and from Egypt, already flourishing in civil society, to people Europe and western Africa. Accounts much posterior in point of time discover those parts of Europe and Asia minor, which are not very distant from these original seats of mankind, yet very thinly peopled by a few wandering tribes, the era of whose settlement is unknown, and who are from thence called sons of the earth, as if they had been the spontaneous produce of the soil. For the preceding silence of history it seems not very difficult to account.

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The first emigrants who travelled up to the sources of the Euphrates and Tigris found themselves stopped in their progress northward by the Euxine sea, then probably, as we shall hereafter shew, uniting its waters with those of the Caspian. Such of them as did not choose to settle amongst the lateral branches of the great chain of mount Caucasus were obliged to turn either to the east or to the west. Those who followed this last direction naturally skirted the borders of the Euxine sea. Having at last gained the Bosphorus of Thrace, through which that sea had not yet forced a passage for the discharge of great part of its waters, they soon perceived themselves environed by the mountains of Hæmus. The different families into which mankind was already divided, though obliged to move slowly with their herds and flocks, their present means of subsistence, strongly impressed with the idea that they were to choose the future residence of their posterity, each separately pressed forward to secure some region far from contention, which might be its undisputed inheritance. Part of these sons of Japhet (*bb*) who peopled Europe spread themselves into the valleys of Thrace and Macedonia; but others, more enterprising, ventured to climb over those mountains into Bulgaria. The Euxine sea, much more extensive than at present, yet covered all the lower plains which now border the Danube, and thus forced the travellers to keep along the northern skirts of Hæmus. Whole generations passed away amidst the fatigues of this long and toilsome march; and their descendants, eager to find more room and milder climates than these mountains afforded them, pushed

pushed forward ; and after many years, in small parties, as occasions offered to these roving tribes, either turned round the head of the Adriatic sea, or passed over the alps of Tirol, and thus gained at several intervals the happier plains of Italy. Others dispersed themselves in the immense forests of Germany and France, and gained not that country till many ages after, through the alps of Savoy and Switzerland. In the course of such unsettled life, those civil arts known to their fathers when they first left their native seats were neglected, and by these forgotten. By a long habit of wandering through countries overgrown with forests these dispersed families became savages, and even in Italy, where some of them arrived at various times and by various ways, remained in that state until such times as more polished adventurers came many ages after by sea from Phœnicia and Egypt to unite and instruct them in the lost arts of civil life. Those who wandered further into the interior, and northern parts of Europe remained much longer in a state of barbarism. It was not till after the diminution of the waters of the Euxine and Caspian seas that the Scythian pastors first settled on the banks of the Danube, and on the intervening tracts between their diminished waters, about 1450 years before Christ, as Herodotus informs us. Such of the emigrants of this same race of Japhet as turned eastward along the shores of the Caspian sea gained the high and open country of Tartary. The soil on this high platform, though prolific of grass, being unfit for culture, most of them became, and have ever since remained, nations of shepherds. Those

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who had more strongly imbibed the taste for cultivation passed forward to the more favourable climate of China, or turned to Indostan. Of these, united into larger societies, more early traditions yet remain. From Cyrene westward the coasts of Africa were yet destitute of inhabitants, or at least the wandering tribes who traversed these tracts are perfectly unknown. Civil society began not there till about the time of the siege of Troy.

Greece and Asia minor, so full of civilised nations, so crowded with celebrated states and cities 500 years before Christ, almost if not entirely desert in the times we speak of, evidently prove that men, few in number, had not as yet been able to occupy regions the most favoured by nature, not very distant from their first seats, which appear fully cultivated and inhabited a few ages after. Nothing surely can more clearly evince the then recent origin or renovation of mankind. The Ionians, descended from Ion, probably the same as Iavan, seem to have been the first inhabitants of Greece. The Dorians, Æolians, and several other little colonies from the Mediterranean islands, or from the coasts of the greater Asia, mixing with these, seem to have taken the common name of Pelasgi. Part of these, restless and unsettled, transplant themselves again to the opposite coasts of Asia minor. In Homer we find Argian Pelasgi in Thessaly, and Pelasgi of Larissa in Phrygia. Others passed over into Italy. Those who remained in Greece soon saw themselves disturbed and dislodged by Egyptian adventurers, and these by the Heraclids, who

who seem to have passed from Crete into that country. Sicyon is said to be the first town of Greece or Europe, and is pretended by the Grecian chronologers to have been built 2089 years before Christ (*ii*). The foundation of Argos, the second in antiquity, does not take place, according to them, till 282 years after. The city of Athens, so renowned in the bright ages of Greece, is founded by Cecrops in 1556. Thebes is built by Cadmus a Phœnician, who first introduced the use of letters to its inhabitants, in 1493 (*kk*). It is not until 1480 that Dardanus, another chief of Egyptian adventurers, plants the first civilized colony on the coasts of Phrygia, at Dardania. His successors extend themselves inwards, and build Troy. The first remarkable event in Grecian history, the expedition to Colchis, took place in 1263 (*ll*); an event which has probably some foundation in truth, though, like all those that preceded it in Europe, obscured under a veil of fabulous circumstances. In consequence, these ages, as well as those that immediately follow them, are, by the Greeks themselves, very properly denominated Heroic and fabulous. In effect, the confusion which arises from a number of unsteady colonies expelling each other in turns, and frequently changing places, renders the thread of history difficult to be seized, throws doubts on every fact, and makes their dates still more uncertain. The taking of Troy, the great era of Greece, is said to have been in 1184. All these dates are such as subsequent Grecian chronologers have attributed to these events, and are all of them evidently too high. The very long interval between the foundation of Sicyon and those of

every other city in Greece, makes its date more than suspicious. That great and learned man Sir Isaac Newton, who ever made himself consummate master of whatever he took in hand, has, from the closer investigation and the careful collation of Grecian stories and genealogies, shewn that the founders of that town and of Argos were not only contemporaries but really brothers; and that Agamemnon was only the ninth king of Sicyon and Argos reunited under his sway, and consequently that neither of them could have existed 300 years before the siege of Troy. He also clearly demonstrates, both from the course of nature in successions and from the records of astronomy, that the expedition of the Argonauts and the taking of Troy (*mm*) must have happened about 280 years after their pretended dates. Having taken his rule from the general course of long successions, and not having sufficiently attended to the possible much longer reigns of a few long-lived kings taken separately, he has probably reduced his dates too low. But making allowance for these small errors, it will clearly appear that the first civilized colonies could not have landed in Greece more than 350 years, or have founded cities more than 300 years before the siege of Troy; and that the Argonautic expedition and the taking of that town must have been ante-dated nearly 250 years. From all this it will appear that the civilization of Greece is much more recent than is established by antient chronology, the truth of which even granted would still prove the infancy of mankind not very far removed. It is not till some time after the siege of Troy that the first dawn, as yet not a little clouded, of historical truths appears; but we must wait to
about:

about the year 776 preceding Christ before chronology merits our confidence. From that era Greece, formed into republics, takes some consistency, peoples rapidly, and rises by hasty steps to perfect civilization, and to that height of renown which will probably not perish, notwithstanding its present abject state, but with the world itself.

But long before those celebrated ages, in which all Greece shone forth resplendent in every kind of human glory, it had produced the prince of poets, who may confidently be consulted on the state of his nation previous to the first olympiad. Common opinion makes Homer born 164 years after the taking of Troy. But the interval is apparently too great. Hesiod tells us, that he lived in the second generation after that siege; and Homer, though probably younger, was his contemporary, and at most of the third generation. Herodotus, who wrote 444 years before Christ, and who must have had no mean authority for what he advanced in presence of all Greece assembled at the olympic games, says, that Hesiod and Homer did not precede him above 400 years. From this testimony we may fairly infer, that the time of his writing cannot be carried much (*nn*) higher than 880 or 890 years before Christ. Thus we see that this great poet, whose works, with some of those of Hesiod his contemporary, are the first which have been handed down to us entire, preceded the first known historian of Greece above 400 years, and must

must therefore convey the surest intelligence of the earlier ages of that country.

Several countries have disputed the honour of giving birth to this sublime poet, who at once carried epic poetry to the highest perfection to which it has ever attained. Model unrivalled, he is the archetype and source of the whole poetic art. Smyrna seems to have carried away the palm in this dispute; and it should seem that it was very soon after its foundation that he was born. Some authors have supposed him born in Egypt, of a daughter of Orus. This is probably a groundless supposition; but we may by the way remark, that this would shew that the demigods of Egypt were not always thought so antient as is pretended. Ambitious of every kind of knowledge, he had probably been a great traveller. He is reputed the father of Grecian mythology; and amongst others Herodotus assures us, that he borrowed from Egypt and their twelve gods, or first kings, the names and functions of those deities he transmitted to his countrymen (oo). He might be thence accused of having debased the majesty of religion, if an idolatry still more degrading had not already obtained in Greece. It must be owned that his ingenious fictions gave more seducing charms to that idolatry. Notwithstanding the almost entire fall of paganism, poetry has still retained his personified divinities, who, animating all nature, lend it infinite grace and ornament. All the knowledge of his

age he eminently possessed; the electric fire of his genius excited not only poets, but orators, painters, and sculptors, to that sublime which their several arts afterwards attained in his country. His topographical descriptions (*pp*) were acknowledged so exact, that his decision was looked to as legal proof, many ages after, by states contending for their limits. He is the first and sole author from whom any real knowledge of these distant times can be drawn. Without giving us a regular history, he has furnished the most interesting picture of the state of Greece at the time of the Trojan war, or more probably of its situation in his own time. In his two poems he carries us not only into every part of Greece and Asia minor, but to every coast of the Mediterranean then frequented by his countrymen. He makes us acquainted with their inhabitants, with their genealogies and manners. In the Iliad it appears that the continent of Greece, as far as the mountains of Macedonia, the adjacent isles, whether of the Egean or Adriatic seas, with those of Crete and Rhodes, were then divided into about 38 little kingdoms. All of these were leagued under their several kings in this grand expedition against Troy. To make his court, no doubt, to their descendants, Homer traces with complaisance the genealogies of many of the heroes, both of Greece, and Asia minor become Grecian in his days. None of these, I think, rise beyond the sixth generation, and many stop short of that number at some god or goddess, from whom the descent is derived. This is to say that the origin is lost or unknown, and is not reckoned but from those men

who

who first dared to separate themselves from the herd of their contemporaries by such bold pretensions, with which they environed their former obscurity, in order to subjugate to their laws an ignorant and savage people. This clearly intimates that the greatest part of those states, whose leaders warred at Troy, were not formed into societies 220 years before its siege, and many of them much later. Priam, whose power and opulence so much surpassed those of any of these petty kings, was only the sixth descendant from the founder of his state. Troy itself, which seems to have so far excelled all the towns of Greece in grandeur and magnificence, was built by his fourth predecessor. How unlikely is it then, that any of the kingdoms or towns of Greece should date so many centuries before it as their chronologies pretend !

Homer gives us the number of the Grecian army under its divers chiefs. By Mr. Pope's computation it amounted to 102,000 men (*qq*). No account is given of the Trojan army and their allies, who comprehended all the nations inhabiting the western coast of Asia minor, of Thrace, and of part of Macedonia. That he may have somewhat exaggerated the strength of his countrymen is possible. This he seems conscious of, by telling us, that it was from the muse herself, who alone could know it, that he derived the information. But the Grecian army, such as he reckons it, may serve as a basis, though perhaps too high a one, on which to conjecture the probable population of those countries in the times of which he speaks. In an
expe-

expedition in which the whole nation concurred with enthusiasm, in which every one of their kings without exception headed his troops, and in an age wherein every man was a soldier, and when the spoils of an opulent city must have strongly excited the cupidity of men accustomed to depredation and piracy, we may reasonably suppose every eighth man capable of bearing arms, or every thirtieth inhabitant, would embark. It appears indeed that Greece long felt the loss of such numbers. This supposition would give us about three millions for the whole population at those times; whilst from history we may deduce, that those countries, including the great islands of Crete and Rhodes, must, some ages after, have contained fifteen millions of people. Even at this day, after 400 years oppression under the depopulating government of the Ottomans; at this day, when the astonishing number of cities flourishing under their republics, long prostrate in the dust, shew at most by a few scattered ruins the grounds on which they formerly stood, the population of all these parts taken together rises to seven or eight millions. It is sufficiently known, that the great progresses of population commence not but with civil and permanent society; and that of three millions at the time of the Trojan war agrees well with the date of the foundations of the Grecian cities deduced from their corrected chronologies. In nearly the same space of time the population of North America, which, like Greece, has received into its bosom successive troops of adventurers, rises not to three millions. But the new Grecian colonies had the advantage which those of America have

not had, of incorporating with the antient straggling tribes of the countries in which they settled. These two circumstances of the foundation of towns, and of the probable population of Greece 250 years after, mutually support and confirm each other; and both together prove the antiquity of civilized Greece much more recent than is pretended by subsequent historians, who, as we have already observed, for want of real dates framed to themselves an erroneous technical chronology, by prolonging the reigns of kings much beyond the course of nature. Contrary to all probabilities, the building of Sicyon is by them placed 282 years before that of any other city in the same country; 905 years before the taking of Troy; and 1411 after the date which Mr. Bailly thinks proper to give to the deluge. It is surely difficult to believe that countries so fertile and so contiguous to Asia, should not have been peopled by more than three millions of inhabitants in so long a space. From this survey, and these presumptive evidences, certainly as legitimate as those that can be derived from chronologies fraught, as we have seen, with such uncertainties and fallacies, I think myself entitled to conclude, that several centuries may probably be discounted both from the ordinary evaluation of the antiquity of Grecian cities, and from the date assigned by Mr. Bailly for the renovation of mankind.

Let us not hastily infer, from the picture Homer has traced of several arts brought to considerable perfection, a long career of civilization in Greece, or even that those arts had arrived at that precise
degree

degree at the time of the Trojan war. We know for certain, that every art of life had been imported into Greece, not long before that epoch, from longer settled and more civilized countries : when once known, a single genius or two improve them in a very short space. That ingenious author has endeavoured to give to the manners of his heroes all the simplicity of antient times ; but he has probably lent to the arts all that perfection they had acquired in his own times, added to all that of which his creative genius conceived them capable. We see, in consequence, heroes busied in cookery and princesses in washing linen. Navigators, as yet, directed their course by a few of the most apparent stars ; their ships carried from 50 to 120 tons : but, arrived at the end of their voyage, they knew no other method of securing them but that of drawing them on shore. Works in iron seem to be unknown ; but sculpture in gold, in silver, in brass, ivory, and wood, seems already to have acquired some degree of elegance. The art of dyeing, and of imitative embroidery, or tapestry, in coloured worsteds, gold and silver, are common ; all the trinkets and ornaments of women seem complete, and by no means despicable. Thus all the arts of luxury appear in a degree of splendour little suited to the portrayed simplicity of manners, or the deficiency of many conveniencies. The Greeks had probably in Homer's time imported, from their expedition to Troy, as the Europeans did after the dark ages from the crusades, these beginnings of magnificence and taste. The shield of (rr) Achilles is a proof of it. The description which the poet gives of it would not dif-

parage the master-pieces of a Phidias or a Michael Angelo. The composition, distribution, colours, and perspective, are all equally worthy of the most celebrated artists. It is not however necessary to suppose, that any artist, even in Homer's time, could have executed it with all that truth and elegance with which the poet conceived it. It was his genius that animated these pictures, which had as yet no model, with an ideal perfection, which if his contemporaries could not imitate, we know at least their successors did come up to. It was the sacred fire which glowed in Homer's poems that elevated the happy disposition of the Greeks, not only in poetry, but in painting, and particularly in sculpture, to that height to which both Romans and moderns have incessantly aspired without ever fully attaining. It is thus that this sublime author, whilst he traced the rusticity of earlier times, yet adorned his works with all the knowledge successively acquired to his own age. It is in his writings that we may discover the first essays, perhaps as yet somewhat uncouth, of all those arts: but to appretiate them exactly by the standard of his poetical descriptions would probably be rash.

After having profited of the lights which Homer affords us to estimate the Grecian history and the state of that country in his times, let us not neglect the sketches he gives us of surrounding nations. Like his Ulysses, he had no doubt seen with judicious eyes both their countries and their manners. It is evident from the precise and unequivocal description which he gives us of the voyage of that

hero, from the isle of Pharos to the continent of Egypt, that the Delta, that since valuable portion of that kingdom, had not yet emerged from the waters (*ss*). It formed as yet the basin of a small interior sea, or bay, whose skirts seem as yet to have been little inhabited and in a state of wild nature. This particularity of natural history is confirmed to us by posterior historians; but Homer proves the entire formation of this fruitful land to have been much later than is usually imagined. The desire of extending the antiquity of nations consonant to popular prejudices induced those historians who wrote several ages after him to remove that change, as well as so many other facts, to much more distant times. The soothsayer Proteus, the god of sea-calves, whom in after-times the Egyptians adopted as a powerful king of their country (*tt*), seems much better to represent a chief of fishermen than an opulent monarch. Homer speaks of the wonders of Thebes with its hundred gates; but from his silence we may assure ourselves, that Memphis was either not yet built, or was of small importance (*uu*). The pyramids, those sumptuous piles, whose erection has been by some erroneously removed beyond the reach of history, had not yet reared their proud heads around it. Would this sublime poet, so fond of the marvellous and grand, have passed by unheeded these striking monuments of the industry, pride, and folly of man?

We must remark, that neither in the Iliad nor Odysssey is the smallest notice taken of the kingdoms of Assyria or Babylon: we
know

know however that they then existed. But the silence of the poet shews us that those powers were still limited to the interior of Asia, and had not yet extended their influence either to Phrygia or any of the Mediterranean coasts. In fact, at that period the forces of these kingdoms, gigantic indeed for those ages and in comparison of those of other states, were yet concentrated within the walls and circumjacent countries of Nineveh and Babylon. From the circumstance of these cities having got so much the start of all others in power and magnificence, we have a right to conclude that they were situated nearer to the first seats of mankind. Thebes in Egypt, which we know to have been very early inhabited, could alone bear any comparison with them: but its splendour, as well as that of those towns, was confined to the interior of the country. In proportion as people advanced towards the coasts, after the interior sea of Egypt had been filled up by the change effected in the course of the Nile, this last lost its glory and pre-eminence, which passed successively to more commodious situations. The power of Lydia, so famous for the opulence of its kings, who 540 years before Christ lorded it over the whole extent of Asia minor, seems to have been totally unknown upon its coasts in the days of Homer.

Those superb cities each of which contained within itself the power and riches of a kingdom, whose ships of war or commerce a few ages after filled every port in the Mediterranean, adorned not as yet the cultivated plains of fertile Sicily. Armies of 2 and 300,000
men

men disputed not as yet some small portion of its envied territory. Almost a solitary wild, it had no inhabitants, save a few bands of robbers, who watched the moment to assassinate the crew of some vessel which might have the misfortune to be driven on its uncultivated and inhospitable shores.

From barbarous Sicily, where he had escaped these dangers, the poet conveys his hero to the island of Calypso, Eoa, isle or promontory of the southern point of Italy. From thence he departs in search of the mouth of the inferior regions. Mr. Pope, a no less enlightened critic than poet worthy to transmit the beauties of his original into the English language, thinks this entrance to have been where Virgil afterwards placed it, in the neighbourhood of lake Avernus. That lake was probably formed in the sunken crater of a former volcano. Environed with barren and uninhabitable grounds, where at every step still gaped hideous caverns sending forth flames and deadly vapours, the spot might not ill represent the mouth of the infernal regions. The direction of the very short voyage of Ulysses from Eoa gives weight to this conjecture; and Virgil seems to confirm it by adopting it. The Greeks, who before the siege of Troy had not ventured further from their coasts, might suppose these shores to approach the limits of the sea. From this last circumstance I should however be tempted to suppose, that these gates of hell were rather situated in the burning isles of the Cyclades, now called Lipari. The first navigators, terrified with the phenomena which

which surrounded them, having from these islands no other prospect to the westward but that of sea, in which they saw the sun set, may have spread the report in Greece, that the extremity of that horizon was the real bounds of the ocean, where that luminary sunk in the waves, and beyond which they imagined eternal darkness must reign. This unbounded view of the sea to the west may suit some of the Cyclades, but could not agree with the situation of the Avernian lake. Homer as a poet availed himself of the licence to adopt every ancient popular story which might give embellishment to his poems by the marvellous, and in consequence inserted fables which more recent discoveries had already proved to be without foundation.

Though conducting his hero so near to Italy, Homer says nothing of that country. He supposed it, no doubt, at least as wild as Sicily, and it is probable that in his time this was no mistake. Before the Trojan war, that delicious country, which has since occupied so eminent a place in the annals of the world, was rather wandered over than inhabited by a few barbarian tribes, whose names only are come down to posterity. These seem to have been chiefly part of the Celtic nations, who, having roved slowly from the borders of the Black sea, had at last penetrated into Italy, either by turning round the Adriatic sea, or by passing through the defiles of the Tirolian alps. A few restless Pelasgi had likewise possibly passed over thither from the coasts of Epirus and Acarnania; for we find that name
given

given to some of its antient inhabitants. In general the Umbrians occupied the northwest of that country, the Sabins and' Aborigines possessed the middle parts, and the still wilder Siculi overran the southern regions. One only civilised people seems to have been already established. At what precise time the Etruscans landed in Italy is unknown: but, from the indications to be traced from their religion and more advanced arts of civil life, one may judge them to have been either of Egyptian or Phœnician origin, and to have arrived at the time when those countries sent out so many colonies to Greece and Asia minor; that is to say, between 1300 and 1000 years before Christ. By the form of government established amongst them I should rather think them to have been Phœnicians. They, as well as the colonies who followed them, gave the name of Indigenes, or of Children of the Earth, to the scattered inhabitants who had preceded them. Some time after their arrival, expelled from the plains, the Sabins first retired into the Apennine mountains for defence: and, thus forced by necessity to reunite, in imitation of their adversaries formed into societies, and in process of time built cities in the champaign country. The civilization of the Latins under their first kings, Picus, Faunus, and Janus, seems to have taken place about 120 years before the siege of Troy. The Aborigines and the Siculi were either overpowered by, or reunited to, their new neighbours, or driven entirely out of the country by the multiplied colonies which, after that epoch, the Greeks and Phrygians established, from the confines of Etruria to the southernmost point of Italy.

It was after that famous siege and the consequent ravages committed by the Greeks along the shores both of the Trojans and their allies, of which they took possession, that the antient fugitive inhabitants took refuge on the then almost unoccupied and desert coasts of Italy. Many of the Greeks too, on their return from that expedition, finding their own country either distracted by dissensions, or a prey to usurpers who had seized on it in their absence, chose rather to seek their fortune elsewhere, and sat down peaceably by the Phrygians, in a land where both were equally strangers. The remaining Aborigines and Siculi who still strayed in these solitudes were incapable of resisting these new-comers, better united, and more experienced in war. The Siculi, more obstinate, driven to the extreme point of Italy, passed over into Sicily; and there, united and instructed by their common misfortunes, began in their turn to build cities. It was not until 540 years after the usual date of the Trojan siege that the Gauls, a part of the Celtic nation, having had to traverse in their peregrinations all the wild and extensive forests of Germany and Gaul, at length crossed the alps of Savoy and Switzerland, to establish themselves in Italy, and give their name to the Cisalpine Gaul. From these, 283 years after, a new body of adventurers took and pillaged Rome, as yet feeble, though already projecting the conquest of Italy. In Africa, to the west of Lybia early peopled by the children of Cham, adored in the temple of Ammon, the most fertile coasts were yet in the time of the siege of Troy unpeopled, unless by roving tribes. It was soon after that era, according to

Virgil

Virgil and Newton, though 300 years later according to the commonly received opinion, that a Phrygian colony under the conduct of Dido, escaping from the intestine divisions of Tyre, imported the arts of civil life into these countries, and in the year 883 before Christ built the city of Carthage, which, some ages after, became the competitor of Rome for the empire of the world. It may not be improper to remark, that this era of its foundation is probably just, and was in fact very little posterior to the destruction of Troy, which the Greek historians have from erroneous data removed to too early a period.

It was thus that from the extremities of western Asia and from Egypt population was slowly and progressively propagated in Europe, and in the greatest part of Africa. Civilization was only introduced into them by colonies from Asia or from Egypt; and upon mature consideration it will appear that the first of these arrived not more than 300 years before the siege of Troy, and the most important of them not till after that event. We see by this, that the first emigrants, setting out from the north of Asia to penetrate into Europe, having lost almost every notion of the arts of civil life in their long and painful journeys by land, remain dispersed and roving tribes, and consequently people very slowly; the last, leaving much later their native countries, at a time when those arts had made still further progress, and not having time to lose them in short voyages by sea, immediately settle in society, build cities, and either subject their rude predecessors, or expel them to lay the first foundations of population in more distant parts.

It would be truly interesting to trace with some degree of probability the origins, and to follow the first progresses, of the nations inhabiting those interior parts of Asia and of Egypt, which were, as we have seen, the principal sources of population to all other parts of the globe. To settle the dates, even within some centuries, of the beginnings of the first great empires which arose there, would be all that could be reasonably required. Unfortunately, profane history furnishes few materials on which we can rely, and the dates of events are still more uncertain. The only original writings of those countries which have escaped the ravage of time are the productions of their priests, strongly prepossessed with the idea of the supereminent antiquity of their nations, and bound by duty and interest to support the fabric of a monstrous mythology. In the first ages, according to Manetho, the sun and the gods reigned over Egypt. The long reigns of these fictive beings certainly deserve not to be discussed. If the names of the gods were attributed to mortal men, their reigns are not to be reckoned by solar years; it plainly appearing by these same authors, that years of one and four months, and even of days, were employed to enhance the antiquity of nations.

The old Egyptian chronicle (xx), to the time of its compilation, reckons 36525 years for the duration of the Egyptian empire: a series of years not founded on historical records, but calculated on an astronomical period. Of these, 34201 years are attributed to the reigns of the gods and demigods; after whom follow thirty dynasties.

ties of men, from the first of whom to the Christian era there should appear to have elapsed 2413 years. Manetho (yy), an Egyptian priest, who lived in the reign of Ptolemy Philadelphus, ascribes 10985 years to the reigns of seven gods and nine demigods. After these he gives an account of thirty dynasties of mortal kings, from Menes. These he composed from the scattered remains of the memoirs of Egyptian priests, whose real records had been destroyed by Cambyfes. Such as he could thence compose it, it has not even come to us in original. There are very considerable variations in the account given us of these dynasties by Africanus and Eusebius. But in both, the amount of the whole series seems to be upwards of 5000 years. The most antient of these dynasties, composed of kings of This, of Memphis, of Elephantis, of Heracleopolis, of Diospolis, and Xoïs, Sir John Marsham and Sir Isaac Newton (zz), with great probability, suppose to have reigned at one and the same time in different parts of that country. Diodorus Siculus, after giving us the various fabulous accounts of the duration of the Egyptian monarchy related by their priests, from 5000 to 23000 years, tells us, that from Menes, the first of mortal kings, 52 monarchs reigned to Bursiris, during 1040 years. After these, it may be deduced from his account that 65 kings succeeded until the conquest of that kingdom by Cambyfes, whose reigns, by the usual computation, would amount to 1365 years. Whence the whole duration of that monarchy to the birth of Christ would appear to be 2859 years. It must be observed, that in another place this same author says,
that,

that, according to other Egyptian priests, 1020 years only had elapsed from the reigns of the gods to the expedition of Alexander, which would reduce the whole to 1350 years. According to Eratosthenes, the number of kings reigning at Thebes between Menes or Mines and Phruron or Nilus is reduced to 36, and the amount of their reigns to 987 years. This Phruron or Nilus (*aaa*) may not improbably be the Phreron son of Sesostris of Herodotus; and Dicaearchus supposes him to have reigned about the time of the Trojan war. This, in following the date we have fixed for that event, would place the reign of Menes in about 1922. But Diodorus places Nilus amongst seven successors of Proteus, who, both according to him and Herodotus, was king of Egypt during that war; a circumstance which would lessen the duration of the Egyptian monarchy. All these records, disagreeing with one another, are bare chronological lists of sovereigns, mostly without facts, or accompanied with such facts as are evidently spurious. The building of the pyramids is attributed to princes of the first, fourth, and fifth dynasties of Manetho, preceding, according to his account, by many centuries the age of Abraham; though we have the united testimonies of Herodotus and Diodorus Siculus to prove that they were erected by princes reigning some generations after the Trojan war. The first of these authors must have been tolerably well informed of the era of their foundation, as the age in which he lived was not more than three centuries after the time he fixes for the building of the first of them. These singular monuments being unknown

to Homer is no small corroboration of the testimonies of these last mentioned writers. The extensive conquests of Bacchus and Osiris, and even of Sesostris, if we allow to these personages the high antiquity given them by the Egyptians, are absolutely unknown to all other nations. Sefac, who flourished during the reigns of Solomon and Jero-boam, appears to be the first Egyptian monarch who carried his arms to any distance beyond the confines of Egypt on the side of Asia; and Sir Isaac Newton (*bbb*) with great probability establishes him to be the same with Sesostris, Sethos Egyptus, and Sesonchosis, who was also honoured with the surnames of Bacchus and Osiris.

Profane history tells us of a first Assyrian empire founded by Ninus, son of Bel or Belus, adored in that country as the sun. Ctesias gives it a duration of 1360 years, which Herodotus reduces to 520. Of the progress and annals of this state no account is given: the space is indeed filled up by a list of names of kings, which, Sir Isaac Newton justly observes, have, except that of Sardanapalus the last king, no resemblance with the names of Assyrian princes, who always compounded theirs from those of their gods Bel or Pul, Adon, Assur or Moloch. Of all this long list of sovereigns, a second Ninus and his queen Semiramis, whose existence is doubtful, are the only personages of whom any thing memorable is related. It appears indeed that Nineveh was built very soon after the dispersion, and that it had its kings, who reigned over that city and probably over considerable districts in Assyria, at the same time that some of the
successors.

successors of Nimrod reigned at Babel or Babylon in Chaldea ; but other circumstances prove, that neither of those kingdoms was sufficiently extensive in these early times to merit the appellation of empires. The conquests of Sesostris and of Sefac, whether they are two distinct princes or one and the same person, in those very countries, where they met with no opposition from potent princes, sufficiently evince that no formidable empires had then arisen in any part of Asia. Even in the time of Homer, the influence either of Nineveh or Babylon seems to have been little extended beyond the confines of the provinces wherein they were situated. We may deduce from Herodotus a first extension of the Assyrian monarchy in 1212; but the first rise of a great Assyrian empire was certainly under Pul, or Bel, 790 years before Christ.

The same uncertainty and obscurity obtain in the pretended antient annals of China. The chronicle of Confucius, in whose time that country was divided into many sovereignties, presents us with a dry list of kings; and the remains of that writer are probably no less faulty and incomplete than the fragments we have of Berosus and Manetho. From the destruction of the antient records of that country we are assured that, for all events preceding three centuries before Christ, their history stands merely on the credit of scattered and mutilated fragments, or on that of the traditions of the learned men of that period. The chronology of India, carried up to 3102 years before the Christian era, whether that epoch is founded or

not

not on real astronomical observations (a point we shall hereafter discuss), is in its first ages filled with monstrous or allegorical fables, and affords no grounds for real history.

From this cursory review of things it evidently appears, that no reliance can be had on the events of any part of profane history previous to 800 years before Christ, which is nearly the era of the first olympiads and of Nabonassar. If before that period some events recorded in the annals of Asiatic nations appear to be founded in truth, they are still surrounded with obscurity, and their dates very uncertain. It is no less true for that whole region than for Greece, that beyond that time history contains more of fable than reality. If we carry our views beyond 1500 years, even that medley of truth and fable disappears, and nothing remains but a very few general traditions, which seem to have been more or less preserved amongst all nations.

From the time of Moses to the era of Nabonassar, we must have recourse to holy writ to guide us through the labyrinth of profane history. Before that time, towards forming any reasonable idea of the state of nations inhabiting Asia or Egypt, whence all other parts of the world have visibly derived their population and civilization, Moses, the most antient of historians, must alone be our guide. We have already remarked that all the details he gives us of the deluge are to be found dispersed in the traditions of almost every

nation which has preserved any memory of things past. We have also observed that the list he has given us of the fathers and chiefs of all nations is very generally confirmed by their antient records and traditions, and further verified by the antient, and in several cases still retained, names of many of them. No greater or more indisputable testimony can be given to the general authority of an historian. But before we take from him an interesting view of the situation of mankind in those early times, it will be necessary to say a few words on the different chronologies affixed to the facts which he records; and we must not dissimble that there are three versions sufficiently discordant as to the space of time elapsed between the creation and the birth of Abraham. These differences arise not however from any variation in facts, but merely from the ages diversely attributed to the first patriarchs at the birth of the sons who form his genealogies, arising either from the mistakes or prejudices of copiers. Moses himself is in no wise responsible for these contradictory chronologies.

That the reader may be enabled to form a judgment on the causes from whence these differences arise, it will be necessary to lay before him a statement of the mosaical genealogies, according to the three versions; to which I shall subjoin remarks on the more or less superior credibility which, it appears to me, belongs to one or the other, as they relate to different eras of the world.

Hebrew

STRUCTURE OF THIS GLOBE.

59

	<i>Hebrew chronology.</i>		<i>Samaritan chronology.</i>		<i>Septuagint chronology.</i>	
	Begat at the age of	Lived in all	Begat at the age of	Lived	Begat at the age of	Lived
Sem	102	600	102	600	102	600
Arphaxad	35	438	135	433	135	435
Kainan	-	-	-	-	130	460
Selah	30	433	130	433	130	460
Heber	34	464	134	404	134	404
Phaleg	30	239	130	239	150	339
Rehu	32	239	132	339	132	339
Sarug	30	230	130	230	130	330
Nachor	29	148	79	148	179	304
Terah	70	205	70	145	70	205
Abraham born	292	after deluge	942		1192	(ccc)

The respectable Abbé Girard, in the learned work which he has given us under the title of *Lessons on History*, gives the preference to the Samaritan chronology, on the rule, certainly in general just, of giving credit to two witnesses wherever they agree against one. This reason would undoubtedly be decisive, if it was absolutely requisite to choose one of the three versions in all its parts without reserve. But as there are necessarily errors in one copy, some mistakes may have also crept into all three; and in some points such seem apparent in all. It thence becomes necessary, critically to examine the several parts of each version, and bring them to the test of that probability which various circumstances seem to indicate. In all that space of time which elapsed between the cre-

ation and the birth of Abraham three distinct eras present themselves. The first ends with the deluge, the second with the dispersion of mankind, and the last comes down to the birth of the father of the Jewish nation.

For many reasons (*ddd*) it seems pretty generally agreed, that the Samaritan chronology is too short, and therefore erroneous in the first mentioned period. I agree with the above mentioned author, that every circumstance seems to point out that the Hebrew is equally too short in the second; but, for reasons which I shall hereafter deduce, I am inclined to believe it more exact than either the Samaritan or Septuagint in the third era. The examination of the two last periods belongs properly to our present purpose.

Noah lived 350 years after the flood. Is it probable that his children, living under the eyes of this common father of mankind, natural lord of the whole earth, should determine to divide it amongst them in his life-time, without apparently appropriating any part of it to him, or without its being even signified what part of it he chose for his own habitation, whilst the different quarters of the world are portioned out to his sons and their descendants? Yet, according to the Hebrew chronology, this incongruity must have taken place. Would the pious Abraham in his various travels have never visited, or even spoken of any relation with this common father of mankind, who, according to that chronology, must have lived 58 years after

after his birth?—Would he never have paid homage to Sem, father of his own particular race, whose residence must have been in western Asia, appropriated to him and to his descendants, and who was not only living during his time, but, if credit is given to this chronology, survived him 53 years? Neither is it probable, that idolatry would be so fully and so generally established in the very life-time of the person who had seen the whole world destroyed by the vengeance of the Almighty, and to whom all the nations of Asia must have yet looked up with filial reverence. It is surely more natural to suppose that it was not till after the death of Noah that the division of the whole earth amongst his three sons could have been thought of. But the strongest, and I think decisive, argument against the very short time allowed by the Hebrew text between the flood and the dispersion, is the insufficiency of numbers to which mankind could in that space have arisen to induce them to this last measure. By the fairest calculations the number of souls from three stocks, in the course of one hundred years, comprehending at most five generations, could scarcely amount to 3000; and of these the last generation and the most numerous part must yet have been in the cradle. Those who have given the largest scope to the quick propagation of the species cannot extend it to above 37000 (*see*). Granting even the possibility of this last exaggerated number, Armenia could not be insufficient either for the abode, cultivation, or subsistence of this yet small tribe. Still less could they find themselves straitened in the fertile and extensive plains of Mesopotamia. Even such a small.

small nation of hunters could not have been at a loss for subsistence: but we know that they had learnt from their still existing fathers all the arts of cultivation known in the former world, to which Noah had added that of the culture of the vine. The numbers of mankind, yet insufficient to cultivate a small province, could not surely dream of separating into very small parties to take possession of extensive distant countries (*fff*). From a fertile country, where all might yet live in ease and plenty, colonies would not be induced to depart in search of unknown distant regions, unless in such numbers, and with such concomitant flocks and cattle, as might render their long journey both safe and easy. But if with the Samaritan copy we compute 400 years between the flood and the dispersion, all these difficulties vanish. Upon a fair computation, mankind might in that space have risen to two millions of souls (*ggg*), and the families of the first leaders of nations would be sufficiently numerous to undertake, without hazard, such long marches, and to settle new regions with a prospect of comfort and success. In this period, therefore, the addition of 300 years to the Hebrew chronology seems consonant to reason and the nature of things.

From all the above considerations it seems evident, that the Samaritan copy has rightly restored 300 years wanting in the Hebrew chronology, in the foregoing period between the flood and the dispersion; but on very similar grounds it appears to me, that it has unwarrantably continued to add a like number of years to the
space

space elapsed between the deluge and the birth of Abraham. The authors of that copy seeing that Phaleg and his predecessors were born about the 130th year of their fathers, probably deemed it necessary to continue for some time to give the like age to that patriarch and his immediate successors at the birth of their sons; and the Septuagint has, on the same reasoning, continued it a generation longer. The authors of both these chronologies certainly imagined that, during the great longevity of men, the age of puberty did not begin till about that period of life; and this opinion still seems to prevail amongst many moderns, though I am persuaded, without real grounds (*bbb*). The Samaritan copiers did not advert, that the age of man, from Heber, was already reduced 200 years. On this account the Septuagint seems also to have added 100 years to the term of the lives of these patriarchs; and Eusebius and some copies have carried this addition quite down to Abraham. The Samaritan transcribers had probably forgot that, according to their own account, several of the predecessors of Noah had been born when their fathers were under 70 years old, at a time when the age of man was double to that of the oldest postdiluvian patriarchs. But the design of Moses was not to enumerate all the children, or to particularize the first born of any of these patriarchs, but merely to give the genealogies of Noah and Abraham, without pretending to settle the rank, in point of birth, of any of their progenitors. Phaleg, whose birth happened precisely at the time of the dispersion, from whence he took his name, was evidently not only the younger,
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but much the younger brother of Joctan, the only one of his brethren mentioned by the historian: Joctan and his 13 sons are already mentioned at that time as leaders and heads of nations (*iii*). Though Phaleg was not an eldest son, Rehu and Sarug probably were so. Nachor and Terah might not any more than Abraham be the first born of their fathers; for, following here the just rule of abbé Girard, I think it probable that 29, the age of Nachor at the birth of Terah, is a mistake in the Hebrew, as we find 79 in the Samaritan, and 179 in the Septuagint, which last still continues to add 100 years. These observations do not indeed totally invalidate the Samaritan chronology, but only shew that there is no necessity in the nature of things for the addition of years given by it to this era. But there is an argument to be drawn from the apparent state of population in the days of Abraham, which appears to me to militate as strongly against the addition of 300 years made by the Samaritan copy in the period we are now speaking of, as it did for the apparently necessary like addition to the Hebrew chronology in the former.

From the state of population, at any period, of a country occupied by roving tribes of hunters, or even by shepherd nations unpractised in, or little addicted to, the arts of agriculture, no real inference can be drawn as to the duration of political society. In a savage and isolated state, where man neither enjoys personal security, nor has the foresight of providing against future exigencies, the

propagation of the species is extremely slow, and is frequently entirely dried up by numberless accidents. A fortunate family, become in two or three centuries a little tribe, is often totally exterminated by its neighbours, without any advantage accruing to these from the unoccupied territory. From the state of a people subject to such extreme vicissitudes, and often prompted to total emigration, no conjecture can be drawn as to the date of the first population of a country. But this is not the case amongst civilized and cultivating nations: though certainly exposed to a sufficient number of evils, war, pestilence, and famine, these transitory disasters are in a fertile country soon repaired by an accelerated propagation, which, in a few generations, fills up the void. If then any reasonable guess can be framed of the number of inhabitants in such a civilized state at any period not too far removed from its first establishment, at a time when, by the yet plenty of uncultivated lands, the means of subsistence are still easy; one might from the apparent face of things judge, with no small probability of truth, of the number of years necessary to form it into that situation. After a certain lapse of time, indeed, when all the lands are fully occupied, and cultivation is carried to its usual extent by the industry of a sufficient number of hands, this mean of calculation becomes uncertain, because population then becomes nearly stationary; emigration disburthens the country of the overplus; or peculiar circumstances of commerce, or some forced industry, provide extraordinary funds of increase. On the other hand, the unceasing scourges of improvident despotism, ravaging

wide-extended empires, render all calculations illusory ; and it is on the contrary the date of such tyranny which can alone be conjectured from depopulation progressively accelerated (*kkk*). On these principles let us examine the situation of western Asia in the days of Abraham. It is the only part of the world the state of whose inhabitants can furnish us with the necessary objects on which our conjectures may be formed ; and in his time it certainly has all the requisites necessary to form them on reasonable grounds.

We have already observed, that the numbers of mankind at the dispersion must have most probably amounted to about two millions. Of these the race of Shem, with the addition of the descendants of Chanaan and of Nimrod of the line of Cham, occupied the whole tract of country now under consideration. We may then with probability allot about 700,000 for the number of the original planters of these extended regions. And we must now confront the natural increase from such a stock in a given number of years with the apparent face of population in the days of Abraham. We are assured that these original founders of the nations then existing in those parts had not lost in too long and disastrous emigrations the arts of civil life, which they inherited from their ancestors. They appear, immediately after the dispersion, to have established themselves in all parts of the country, in small civil societies, and to have every where founded a great number of small towns. This race of men, becoming almost generally sedentary and addicted to cultivation,

tion, have all the qualities required to form a judgment on the duration of their establishment from the state of population at that early period of time.

Abraham, as yet childless, but destined by Providence to be in time the father of a numerous race, who are still to be wanderers and strangers on the earth for 400 years, when the hand of God is to lead them to their already promised settlement, seems to be the only unfixed personage of consequence. Accompanied by the family of his nephew, and surrounded by numerous domestics, he roves at will. Great tracts of land, yet unoccupied and unclaimed, allow free liberty for this large family with its numerous flocks to move from place to place. Divers families had already seated themselves in every country of Asia; but they formed not as yet numerous nations, but tribes, already pretty considerable, settled in society at certain distances. The hospitable patriarchal life of Abraham, uniting freedom, security, and abundance, in the midst of numerous attendants, who serve him more from respect and love than from necessity, presents us with that enchanting picture of true happiness which, in our times, can only be found in the dreams of poetry. Men not rejected for crimes or penury from society, but independent and respected so long as they deserved respect, without renouncing the true conveniences of life, might undisturbed enjoy this enviable situation in countries yet unclaimed, though highly favoured by nature and by climate. But to this life of simplicity and tranquillity the greatest number of

mankind, in these same regions, preferred civil community diversified by more extensive society, by more active life and bustle, in which each, by the cession of a small part of his personal liberty, purchased general protection, and in which mutual assistances and various modes of industry rendered the exchange of conveniences and enjoyments more easy and abundant. In consequence of this more general predilection, small towns arose in the most convenient situations, whose inhabitants cultivated their environs, or procured easy subsistence by other labours useful to their fellow-citizens. Landed property was already established, since we find Abraham purchasing a field for the burial-place of his family. From the same transaction we perceive, that coined silver in circulation already furnished the means of an easy and common exchange. The arts of weaving and embroidery, the forging of metals, iron perhaps excepted, were already known; works of pure ornament and luxury were already carried to some degree of elegance. At this we must not be surprised, since this part of the descendants of Noah had not lost in the course of long emigrations any of the arts known before the deluge. But these towns had not yet extended their claims beyond those lands which their inhabitants were able to cultivate. There was ample space in vast tracts which as yet acknowledged no masters, even on the banks of the Jordan, in the midst of the numerous towns situated in the valleys of Chanaan, for Abraham and Lot, their great train of domestics, and their numerous flocks. On these they ranged or encamped at pleasure, signifying merely from mo-

tives of decorum their intended residence to the nearest towns, who, far from taking umbrage, strove to engage them to fix their abode in their neighbourhood. When, to avoid quarrels amongst their servants, Abraham and Lot resolve to separate, the one takes to the right, the other to the left, agreeing only that the point of separation shall in future be the limits of their future perambulations. We soon after find Lot, who no doubt began to be tired of the monotony of this wandering life, retiring to Sodom, whose inhabitants had engaged him to fix his abode with them. In that already dissolute town profligacy is carried to excess. The invasion of the Elamites, from which it is delivered by Abraham, reforms not its inhabitants, whose crimes at length bring down the most signal vengeance of heaven on their heads. It appears, that in that age each town had its chief or king, but it was a paternal government, in which a council of elders shared the sway, and in which the people were yet respected. Egypt, or at least that part of it, the Thebaid, then inhabited, was already famous for its riches in corn; it was governed by kings who had the common name of Pharaoh or Lord; but the monarch appears not yet secluded from his subjects by that forbidding pomp which soon environed the courts of sovereigns. The arrival of a travelling stranger is immediately known to him. He causes indeed the beautiful Sara, whom he deemed unmarried, to be taken from Abraham; but hearing she was his wife, he respects the sanctity of marriage, and endeavours to appease her offended husband. The same thing happens at the petty court
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of Abimelech, king of Gerar. Some warlike and enterprising princes seem indeed to have already overleaped the bounds of limited authority. Not content with subjecting their subjects to arbitrary will, the passion of domineering had prompted them to exact submission and tribute from their neighbours. Human blood already polluted the altars of ambition. Thus we see a king of Elam (part of western Persia) with three other chiefs, his allies and probably tributaries, making war on five petty kings of Chanaan, who had refused the tribute he had before imposed on them (*III*). The means of the conquerors of this age were not however equal to their thirst of dominion: a Cyrus, a Xerxes, an Alexander, or a Cæsar, had not yet sacrificed millions of men to their senseless glory (*mmm*). But these petty leaders of rapine laid waste small districts beginning to be fertilized, and carried off the bloody spoils of the vanquished. The monarchs then attacked were certainly not formidable, since it appears that the whole territories of the five kings could not have an extent of more than 40 leagues square; though Abraham and his friends unmolested fed their numerous flocks within that same space. The four victorious chiefs who were carrying off their treasures and their flocks, unexpectedly attacked, are defeated by less than 400 followers of Abraham. Melchisedec, another king in Chanaan, seems to have come to their relief; but though come too late to participate in the victory, Abraham adjudges to him, as high priest, a tenth of the spoils. Who he was is not said; but I conjecture him, from this great respect shewn to him, to have been a son of Shem,

perhaps

perhaps his last surviving offspring. The priesthood not being yet a distinct function, the sovereign pontificate seems naturally to have devolved on him, as representing the father of the whole race. Let us observe, that only the most fertile plains of Chanaan were yet peopled, though not fully. The neighbouring countries were still void of inhabitants. It is long after the time we are now speaking of, that the Moabites and Ammonites, descendants of Lot, take possession of the bordering tracts to the southward of Palestine, which yet seem entirely uninhabited.

After the death of Abraham, whilst new families of Chanaan found new nations in the interior of the country, the offspring of Ismael his son by Agar, with the children of the same patriarch by ~~Sethura~~, *Sethura*, take possession of Arabia petrea. More than a century later, the Edomites, sprung from his grandson Esau, in conjunction with the Horites made settlements to the east of these in Arabia deserta. From this aspect of things in the days of Abraham, when men had not yet spread themselves beyond the most fertile vales of Palestine, it is not possible to suppose that this whole part of southern Asia could possess more than a million of inhabitants; or that in the same proportion Babylonia and the whole extent of countries occupied by the descendants of Shem were yet peopled by more than 10 or 11 millions (*nnn*). Such a population may well accord with the natural increase of men, from 700,000, which we have reasonably supposed might have been the number of those who first took possession

fection of all these several countries at the dispersion, in the space of 316 years from that time to the call of Abraham ; but can in no wise suit with the necessary progress of increase, which, in such fertile countries and favourable climates, under the circumstance of longevity still double to that of the present times, must have taken place in 616 years, which is the space the Samaritan chronology supposes to have elapsed between those two events. The population of that part of Asia should at least within that time have amounted to 50 millions (*000*). To shew that this supposition is not gratuitous, let us compare the aspect of the southern part of Asia which we have already observed in Abraham's time, with the situation of the same countries when invaded by the Israelites under Moses and Joshua, agreed by both versions to have happened 430 years after the call of that patriarch. The Moabites, the Ammonites, the Edomites, with new nations sprung from the Chanaanites, whose founders were yet unborn in the first period, and inhabiting countries bordering on Palestine unpossessed in Abraham's life-time, oppose with courage, and often with success, an army of 600,000 combatants led by the Jewish legislator. Palestine itself swarms with numberless inhabitants, and is defended by numerous fortified towns, which yield not to the strength of Israel, but to the powerful hand of God. When possessed of these frontier barriers, this formidable army is yet unable totally to subdue the inhabitants, nor are they fully subjected till the reign of David. There is equal proof of the yet feeble population of Egypt when visited by Abraham,

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ham, since it appears by evident indications that the natives could not exceed three (*ppp*) millions when the children of Israel left that country. A few centuries after, all Asia trembles, and is subdued by the conquering arms of that multiplied people. In fine, every circumstance concurs to prove, that in the age of Abraham, which does not carry us to 2000 years before Christ, mankind was yet in feeble infancy, and very thinly dispersed even in the most fertile countries. The founders of many nations, which afterwards became powerful, were yet unborn; and even those empires which first appeared with the greatest splendour in the annals of history, were then weak, and confined within very limited districts. Such very restricted population in the days of Abraham could not be the natural produce of more than 600 years in a favourable climate; and therefore the time elapsed between the dispersion and the call of that patriarch must have been shorter than that given by the Samaritan copy.

Such are the deductions which may be fairly made from the representations of that historian who lived nearer by many centuries to the times of which we are now speaking than any other writer whose works have escaped the ravages of time. But to invalidate that preference so justly due to the mosaical narrations, it has been observed, that in the age of authentic profane history we no longer find in the Greek and Roman authors the same names of towns, provinces, or nations, which are given to them by Moses and

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the sacred writers. Such an objection can only proceed from those who are but superficially informed, or from those who purposely wish to mislead. A sufficient number of these which occur without any sensible alteration, or which in different languages are expressed by synonymous terms, notwithstanding the lapse of time and frequent changes of domination, still do homage to the veracity of those writings. The Greeks, very naturally attached to the harmonising sounds of their own language, softened to its tone those barbarous names which offended their ears; or, more anciently, translated into their own tongue names which generally bore a meaning. The Romans, through pride, in sending colonies into those countries, endeavoured to efface their antient appellations, by imposing Latin names entirely different. In spite of these masters of the world, great part of the nations, provinces and cities of Asia have preserved their antient names, modified solely by the different pronunciations or terminations of the victorious languages. Damascus and Sidon have, from time immemorial, retained those names without other variation than such as these occasioned. Aiguptos and Ægyptus are only varied pronunciations of Ai-coptos, or Ai-caphtor. The sound of some names indeed totally disappears in translations. But it is no less singular than worthy of remark, that the Tartars and Arabs, subdued by the arms or usages of those various conquerors, have restored to many towns and provinces of Asia their antient denominations, forgotten for many ages in the country itself. They are the same as were given them by the Jewish writers. In the time of
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the Greek sovereigns, or of the Roman emperors, one might have in vain searched for Balbec or Tadmor, disguised under the more harmonious titles of Heliopolis and Palmyra, which are however mere translations of the former. At this time we might as fruitlessly address ourselves to the Arabs to find them under those softer names. Byblos still exists at present under its oriental name of Gebel or Gybele, as the Hebrew historians call it. Tyre, called in scripture Sor, is denominated Sur by the Arabs: to Sufiana, Chus has again given his name of Chufistan. Grand Cairo, as the capital of Egypt, is called Mefr, from Misraim grandson of Cham, by the Cophts, who have resumed their antient title derived from Caphtor. Turgoma has again given his to the Turcomans and their country. It is probable that the name of the province of Irac is a small variation of Erech or Arach, one of those towns built by Nimrod in that country. Tchin, which is the true name of that country we call China, is a varied pronunciation of the Gog or Gin of the western or eastern Tartars, whom those nations acknowledge as their founder. In the 13th century the southern part of that kingdom still bore the name of Matchin, the Chinese pronunciation of Magog (*qqq*). Hence the Chinese are evidently proved to be the descendants of those two patriarchs. Thus we see the Tartars and Arabs, the most antient and unmixed nations of the earth, who had for ages kept aloof and ever independent of the various masters who by turns possessed themselves of western Asia, descending from their antient retreats to pay new homage, after so many ages, to the veracity of the Mosaic history.

It is thus we find a nation known to Europe within four centuries, and of which the Persians, Greeks, and Romans were totally ignorant, situated at more than 1500 leagues distance from Judea, still bearing the name of those first fathers of the north and east indicated by the Jewish writer. This surely is a striking proof of the valuable exactness of his narration, even with respect to facts absolutely foreign to the Israelites. This restoration or preservation of antique names by nations so distinct in religion, and so separated by situations, is without doubt a fact no less singular than striking, which invincibly proves that 3300 years have served only to illustrate and confirm what Moses had so long ago advanced on the first origin of nations.

From this general review and critical examination of antient history, both sacred and profane, it will finally result that a general deluge is a fact ascertained and confirmed by the constant tradition of almost all nations. A learned and celebrated author, not to be suspected on this point, owns that that event cannot be placed higher than 3500 years before the Christian era. Far from allowing us to remove higher that extreme date, many circumstances seem to prove that it would be much more reasonable to bring it considerably lower. Those profane histories which attempt to rise higher than 2000 years before Christ, present us with no other than dry and jarring lists of kings without facts. The pretensions of some nations to carry back their annals to an antiquity greatly exceeding those bounds,
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are evidently founded on pure vanity, and supported by allegorical fictions transformed into histories. Even so high as the age of Moses their accounts are mutilated and uncertain; and beyond that time are so tinctured with fable as to render the few real facts they may contain dubious. As we ascend in antiquity, they become the history of allegorical or imaginary beings; that of men appears every where circumscribed within very narrow bounds. Their pretended chronologies, interspersed with long interruptions and voids, are in early times indeterminable for want of a constant measure of time, and can only be brought by conjecture to any thing like a regular system. Western Asia and Egypt are the only civilized countries of whom any thing can be said with a certain degree of authenticity 1500 years before Christ. If the Greeks carry back the pretended foundation of some of their cities to above 2000 years, they at the same time own all the events of those times, and of several ages after them, uncertain and mixed with fable; and Hesiod and Homer, their first known writers, furnish us with evident indications, that the civilization of Greece did not really take place 300 years before the Trojan war. This becomes the more probable, as we perceive the nearest and most fertile countries of Europe and western Africa, where a few barbarians roved alone before, receiving after that siege feeble colonies, which first carry to them the arts of civil life. The writings of Moses alone furnish us with a succinct, clear, and regularly followed view of the state of western Asia about 2000 years before Christ. In these, we descry in those
fertile

fertile tracts, in the days of Abraham, a yet thin population, divided into families and tribes, or small nations in early infancy. He points out, not only at that period, but in the following ages, the first fathers of several tribes already become numerous in his own times. Before that period, this consistent author ascends by a few generations to that great event which was the cause of this then very limited number of men ; and the principal incidents which he relates of that revolution on our globe are confirmed by the general traditions of all nations. He traces the division of the earth amongst the descendants of the first families escaped from the general wreck—he names the leaders of these emigrations, and they are acknowledged by the most antient, and especially by the most unmixed, nations for their founders. In the age of the first progenitor of his own nation every thing indicates the infancy or the late renewal of mankind. Asia, evidently the first cradle of man, is yet only half occupied ; but in his own times, 430 years after, every appearance is changed in that country. The progressive increase of population had in that space filled every corner of it with a number of growing states. Nineveh and Babylon had taken the lead, and become great and potent cities ; but their dominion was yet restricted to very limited territories ; and we must wait three or four centuries later before we see them extending their sway to more distant countries. Even in the days of David king of Israel, Syria is yet divided into several petty kingdoms. His successor, Solomon, is apparently the greatest power in Asia, and it is not till after his death

that Affyria, Babylon, and Egypt, become truly formidable to their neighbours. At that late period, or very little earlier, countries no less favoured by nature, in near proximity to Asia, are yet barbarous, or in the very infant state of society. The coasts of Asia minor itself, as well as those of Greece, are not two centuries before receiving their first civilization from Palestine or Egypt. The arts of civil life are yet to extend themselves slowly to contiguous parts of the world. It is not till after the siege of Troy that Sicily, the greatest part of Italy and north-western Africa, hitherto the receptacles of a few wandering savages, receive successively, and at several intervals, small colonies from their more enlightened neighbours, to found their first connected states. From the vocation of Abraham, when the best peopled parts of Asia were fostering numerous indeed, but still infant states, and when the fathers of many afterwards powerful nations were yet unborn; whilst, during several subsequent centuries, men were yet seeking settlements to their taste; it required the lapse of 1100 years to form the first great empire under the Assyrian Pul. But in succeeding ages, when population became more accelerated in countries which had already received some wandering tribes, from the daily diminishing inclination to distant emigration, and from the possibility of reuniting to civil society a greater number of scattered inhabitants, five hundred years were sufficient to raise Greece, Sicily, and Carthage, from a savage state to grandeur not unequal, and to a much higher degree of polish. From equally small beginnings the Roman republic, within a like period, rose to a still more astonishing height. Can

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we then with any shadow of reason pretend that thousands of years were necessary to produce the feeble population and weak state of Asia in the time of Abraham? Seven hundred years from the deluge to his vocation is surely a space of time amply sufficient to create the degree of population which appears to have then obtained in it; and, every circumstance considered, it seems difficult to suppose it greater. Such having been the very flow progress of population in countries where civilization appears to have been coeval with the first appearance of the renovated human race; and such being its natural rapid rise in others contiguous to them, from the moment they, many ages after, became civilized; it appears evident that the state of mankind 2000 years before Christ cannot warrant a much higher antiquity than I have assigned to the deluge, and certainly combats the extension to 3500 years, contended for by Mr. Bailly. The sons of Japhet furnish us with very little towards the antient history of mankind. With respect to their annals, sacred and classic history are equally silent. The greatest part, roving over the wilds of northern Europe and Asia, appear not as settled or at all known nations till many ages after the time of Moses. But to his account the better united oriental nations pay homage to this day, by acknowledging themselves the descendants of Gog or Gin, the son of Japhet. Some persons have eagerly seized on the fabulous history of China, as corroborating the cause of high antiquity. Like the Egyptians, the Chinese have had the vanity to imagine they were the first of men, and that their origin is to be traced through endless generations till it is lost
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amongst the gods: but the best informed historians of that nation avow all annals beyond three centuries before the Christian era uncertain and mixed with fable. The name they yet bear shews that people to be descended, as well as their northern neighbours and present conquerors, from Gog. It is probable that their first settlements in the north-western parts of that empire were made in the first or second century after the dispersion, which, as a continued civilized state, will certainly prove it to be the oldest in the world. Those nations who immediately coalesced in civil society, and applied themselves to cultivation, wanted not the instructions of a more antient, unknown, and long lost people, as Mr. Bailly has pretended in his first, I may say, wild system, which you will give me leave more amply to discuss with you in my next letter. The first fathers of the present race of men had learned from their ancestors born before the flood all the arts of civil life known before that event, and had continued to practise them for 400 years, during which all mankind lived together in Armenia, or in the plains of Mesopotamia; and those who preferred not an independent roving life, more congruous to the inclinations of no inconsiderable part of men, had nothing to do but to preserve, in whatever part of the globe they fixed, those arts of which they were already possessed. In every fixed and permanent state of society this could not fail. The 3100 years of astronomical observations in Indostan, brought forward by Mr. Bailly in his second system, as a proof of the present world being

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much more antient than is generally allowed, I shall have an opportunity of discussing in another place.

After all, it must be allowed that the precise date of the deluge cannot be determined with absolute certainty. The preference which may be given to one or other of the three versions of Genesis, or to parts of each of them; the more or less credit which may be given to certain antique chronicles; different lights in which the state of nations and the progress of population at this or that period may be viewed; may furnish to several minds results sufficiently discordant on the duration of time elapsed between the flood and the birth of Christ. The shortest possible seems to be that adopted by the Hebrew chronology. Above, sir, I have given you my reasons for fixing it to about 350 years more, to be inserted between the deluge and the vocation of Abraham. It seems that no supposition, unless founded on fables evidently too absurd to merit a serious refutation, can carry that interval beyond 3500 years. That extreme duration, which I think I have demonstrated too great for probability, still remains infinitely too short for the justification of those who, in despite of all fair reasoning and evidence, are determined to give the present world, since a revolution which must have almost annihilated the human race, an antiquity at least double, if not indefinite.

Before I conclude this disquisition, you will give me leave, sir, to
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lay before you a short chronological list of facts occurring in antient history, to which I have affixed dates according to the system I have adopted, and the several observations which I have made in the foregoing sheets. To these I have also added the dates according to Usher's chronology, the most generally in use. By adding 300 or 600 years to the interval between the flood and Abraham, you will easily compare my dates with those of the Samaritan or Septuagint versions. But I trust, in the duration I have allowed before the birth of Christ you will find ample space for the gradual increase of mankind and the successive settlements and progress of nations, as they appear in history.

First Period.

Origin of nations, foundations of the first towns and monarchies known ;
containing a space of 1383 years after the deluge.

		<i>Years before Christ.</i>	
		According to the author	According to Usher and Mr. Blair
General deluge	- - -	2698	— 2348
Death of Noah, the restorer of mankind,		2348	— 1998
Building of Babel, followed by the dispersion of mankind	- - -	2297	— 2247
Death of Arphaxad, 38 years before that of his father Shem ; and, probably nearly at the same time, of Chus, son of Cham, the father of the western and oriental Ethio- pians ;	M 2		

*Years before Christ.*According to
the authorAccording to Usher
and Mr. Blair

pians; and also of Iavan, or Ion, son of

Japhet, father of the antient Greeks 2258 — 1908

Death of Shem. One may also conjecture,

that towards the same time Cham, father

of the nations of southern Asia and of the

Africans, finished his course. It should

appear probable that this patriarch finished

his days in Libya, where he was in after

ages adored in the celebrated temple called

Ammon-No, or the Abode of Ham. Japhet

also, the general father of the Europeans

and of the northern and oriental Asiatics,

probably also paid the debt of nature about

the same time - - - 2196 — 1846

Death of Phaleg, born in the year of the dif-

perſion, 65 years before that of his father.

Heber. With him, probably owing to

some further changes operated on the

face of the earth, the life of man begins

to be shortened 200 years, and from him

gradually decreases - - - 2058 — 2008

Death of Selah, son of Arphaxad; and to-

wards the same time of Chanaan, who first

peopled

*Years before Christ.*According to
the authorAccording to Usher
and Blair

peopled Palestine; of Mesraim, son of Chus,
who descended from Ethiopia into Egypt,
whose capital always bore his name. He is
most likely the same as Menès, and with
him we date the first beginning of an Egyp-
tian monarchy - - -

1998 — 1878

Death of Heber, father of the Hebrews, and
it is thought of the Iberians, or the inhabi-
tants of the present Georgia. We may
give the same date to the death of Nimrod,
who built Babylon; of Sidon, who founded
the city of that name, mother of the still
more famous Tyre; of Caphtor, son of Mes-
raim, whose name is inherited in our days
by the antient natives of Egypt; of Gog or
Gin, father of the oriental Tartars and of
the Chinese, who are still called by his
name, softened into Tchin; of Gomer, fa-
ther of the Celtic nations, who spread them-
selves in all the north-west of our continent.
In this space of time from the dispersion, the
most antiently celebrated cities of Babylon,
Nineveh, Damascus, Thebes in Egypt, and
Sidon in Palestine, were founded - - -

1993 — 1817

Vocation

*Years before Christ.*According to
the authorAccording to Usher
and Mr. Blair

Vocation of Abraham, father of the Israelites
and of the inhabitants of Arabia petrea and
deserta. Before this time, in my opinion,
all those who had been witnesses to the de-
luge and to the dispersion had already dis-
appeared from the face of the earth. The
Hebrew chronology very improbably makes
even Shem survive this era 135 years: I
imagine his death to have preceded it 215
years (*qqq*) - - - - -

1981 — 1921

Ismael, son of Abraham by Agar, establishes
his family with those of that patriarch's
children by Ketura, in Arabia petrea, leav-
ing his brother Isaac still in Chanaan. The
posterity of Lot, the Moabites and Ammo-
nites, settle themselves on the southern bor-
ders of that country - - - - -

1881 — 1821

Efau, son of Isaac, father of the Edomites, in
conjunction with the Horites takes posses-
sion of Arabia deserta to the mouth of the
Euphrates - - - - -

1776 — 1716

Jacob and his children remove from Chanaan
into Egypt, where they are settled in the
land of Goshen, in the north-eastern part of
that kingdom - - - - -

1766 — 1706

*Years before Christ.*According to
the authorAccording to Usher
and Mr. Blair

The Israelites leave Egypt under the conduct of

Moses. The several nations whom he routed in his passage to Palestine began to take refuge in the deserted land of Goshen in Egypt; and the Amalekites flying from Joshua were, as the oriental historians testify, the second shepherds who invaded and got possession of great part of Egypt

- 1551 — 1491

Origin of the Scythians according to Herodotus.

It is probably nearly the date of the first appearance of a part of the descendants of Japhet in a national body on the banks of the Danube and on the borders of the Euxine and Caspian seas

- - - 1444 —

Second Period, containing 984 years.

Progress and extension of population—civilization of Greece and Italy—rise of the first great empires; and, towards the end of it, flourishing state of Greece, and as yet feeble beginnings of Rome.

*Years before Christ.*According to
the authorAccording to Usher
and Mr. Blair

Mephres reigns, and unites all Egypt from

Syene to Heliopolis (rrr)

- - 1315 — 1665

Misphrag-

*Years before Christ.*According to
the authorAccording to Usher
and Mr. Blair

Misphragmutosis, his son, pursuing the war
against the shepherds, obliges most of them
to depart the land, and shuts up the rest of
them in Abaris or Pelusium. In his or in
the succeeding reign, part of these, under
Lelex, Pelasgus and others, carry with them
the first dawn of civilization into Greece 1285 — 1653

About the time these strangers landed in Greece
lived Ogyges, an old inhabitant, of Scythian
or Japhetian race, in whose days happened
the deluge called by his name - - 1280 — 1796

Thetmosis, having taken Pelusium, finally
expels the shepherds. Here ends, in my
conjecture, the 511 years reign of the
shepherds in Egypt, according to Herodo-
tus. The Israelites occupied part of the
country during 215 years, and during the re-
maining 296 years the Amalekites had nearly
possessed themselves of the whole (sss) 1255 — 1627

After the failure of the sons of Lydus or Lu-
dim, a new race, whom Herodotus styles
Heraclidæ, possess the kingdom of Lydia;
the first of whom was Agron, grandson of
Belus (ttt) - - - - 1223

The

STRUCTURE OF THIS GLOBE.

89

Years before Christ.

According to
the author

According to Usher
and Blair

The Assyrian monarchy extends itself by the subjection of part of upper Asia, according to Herodotus. Ctesias dates this dominion 851 years earlier. If it is meant to recur to the first foundation of that kingdom under Assur, it must be carried still higher; but probably many ages passed before its limits exceeded those of Assyria proper (*uuu*)

1206

First foundation of Sicyon by ~~Ægial~~Ægialus, brother of Phoroneus who about the same time founded Argos, both of them sons of Inachus. The Greeks place the building of the former 889 years earlier, and 282 before that of Argos

1200 — 2089

Oenotrus, younger son of Lycaon, leads the first colony from Greece into Italy. He is the Janus of the Latins

1148

Dardanus settles on the coast of Phrygia (*xxx*)

1115 — 1480

Flood of Deucalion, which, according to Hesiod, happened about four generations before the Trojan war

1075 — 1503

Tros, grandson of Dardanus, possibly forced by the effects of this flood to retire from the sea coasts, builds Troy

1055 — 1374

N

The

Years before Christ.

According to the author According to Usher and Mr. Blair

The Edomites and other nations conquered

by David, king of Israel. By his successes the Jewish monarchy becomes very considerable in southern Asia, and its splendour lasts till the death of Solomon. Sir Isaac Newton with probability supposes Cadmus, who first introduced the use of letters into Greece, to have been one of those Phœnicians who fled from David - - 1048 — 1493

Ammenemes, Amenophis, or Ammon, reigns in

Egypt, and conquers Ethiopia and Libya (yyy) 1034 — 1416

Minos reigns, and gives laws to Crete. Though

only grandfather to Idomeneus, who warred at Troy, he is by the Grecian chronologers made to reign 222 years before the date they assign to that siege. In his time, according to Herodotus, the Carians and Lycians passed from that island to settle in Asia minor. Soon after, Hercules might come into Greece; and Tyrrhenus, the Lydian, settle at Tyrrhene, in southern Italy (zzz) - 1015 — 1406

Sefac, or Sethos, or Sefenchosis, the same as Sefostris, to whom the names of Dionysius and Bacchus were also given by the Greeks.

STRUCTURE OF THIS GLOBE.

91

Years before Christ.

According to
the author

According to Usher
and Mr. Blair

Phlyas and Eumedon, his sons by Ariadne
the daughter of Minos, were Argonauts.
He overruns all western Asia, and penetrates
into Thrace. His brother Danaus, who
at his father's death had usurped Egypt
during his absence in Libya, flies into
Greece (*aaaa*) - - -

1002 — 978

Theseus reigns, and soon after unites the twelve
cities of Attica under one government es-
tablished at Athens (*bbbb*) - -

991 — 1234

Argonautic expedition - -

971 — 1263

Troy taken (*cccc*) - -

935 — 1184

Several of the fugitive inhabitants of Phrygia,
as also some Greeks, settle colonies in Italy,
and introduce a greater degree of civiliza-
tion on the coasts of that country. Bursa, the
citadel of Carthage, might be, as Virgil asserts,
built about this time - - -

933 — 1182

Hesiod writes, as he himself tells us, in the age
or generation next after that which saw the
sieges of Thebes and Troy, about 35 years
after the latter - - -

900 — 913

Homer was contemporary with Hesiod, and
flourished soon after him. In his days Si-

N 2

cily,

*Years before Christ.*According to
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and Mr. Blair

cily, yet uncultivated, was peopled by roving barbarians ; but the spirit of adventure continuing from the coasts of Asia and from Greece, it is probable it would soon after receive more polished inhabitants	-	890	—	907
The city of Carthage built	- -	883	—	869
Cheops, according to Herodotus the fourth successor of Sesostris, reigns in Egypt, and during his long reign builds the first great pyramid (<i>dddd</i>)	- - -	880	—	
The Heraclidæ return into Greece	-	859	—	1104
Pul, by the conquests of Media, Persia, Syria, and Babylonia, founds the great Assyrian empire, according to Sir Isaac Newton (<i>eeee</i>),		790	—	777
Sanconiatho writes, according to Sir Isaac Newton,	- - - -	760		
Pul is succeeded at Nineveh by Tiglathpilassar, and at Babylon by Nabonassar. The era of Nabonassar begins	- - -	747	—	747
Archias of Corinth builds Syracuse, according to Sir Isaac Newton,	- -	719	—	732
Semiramis flourishes. She is fabulously placed in very early antiquity ; but, according to Herodotus, Labynitus, in whose reign Babylon				

STRUCTURE OF THIS GLOBE.

93

Years before Christ.

According to
the author

According to Usher
and Mr. Blair

bylon was taken, was only her sixth de-			
scendant (<i>ffff</i>) - - -	718	{ 1215 or 2007	
Lycurgus gives laws to Sparta, as shewn by Sir			
Isaac Newton, in - - -	708	—	884
The Medes, under Dejoces, revolt from Af-			
fyria (<i>gggg</i>) - - -	686	—	700
Rome built (<i>bbbb</i>) - - -	669	—	752
Nabopolassar revolts from Assyria, and reigns			
over Babylon, which henceforth becomes			
very powerful - - -	625	—	625
Cyaxares king of Media, and Nabuchadnezzar			
king of Babylon, destroy Nineveh, and share			
the Assyrian empire. The Scythians invade			
Media (<i>iiii</i>) - - -	609	—	606
Babylon taken by Cyrus and Darius the Mede			
(the same as Aftyages). They had taken Sar-			
dis six years before - - -	538	—	538
Cyrus, overcoming Darius, transfers the empire			
from the Medes to the Persians -	536	—	536
Cambyfes reigns, and subdues Egypt -	529	—	529
The kings of the Romans expelled, and con-			
fuls created - - -	508	—	508
Xerxes invades Greece; battles of Thermo-			
pylæ and Salamis - - -	480	—	480

Death

*Years before Christ.*According to
the authorAccording to Usher
and Mr. Blair

Death of the Chinese philosopher Confucius.

In his time northern China was still divided into several sovereignties, paying homage to a chief king of that part. It is not known whether the southern parts of that country were yet inhabited: more than 1800 years after it was a distinct monarchy, under the

name of Matchin - - - 479 — 479

Herodotus, at the age of 36, writes his history 444 — 444

Rome taken and pillaged by the Gauls, who

near three centuries before had settled in the north-western parts of Italy - - 390 — 390

Darius, the last Persian king, conquered by

Alexander, and slain. Rise of the Grecian empire in Asia and Egypt - - 331 — 331

The first period contains, according to my supputation, 1383 years from the deluge, but only 1033 according to the Hebrew chronology. Dating from the dispersion, it comprehends according to me 982 years, and 932 according to the Hebrew. If 101 years, allowed by the latter from the deluge to the dispersion, apparently give not sufficient room for the multiplication of the human species to enable men to occupy countries very distant from the point of separation, the natural progression during 300 years more, whilst
men

men lived above 400 years, will surely furnish a sufficient increase to make that occupation easy. By families and tribes, become in this additional term of years, and by these peculiar circumstances, far from inconsiderable, distant emigrations might be undertaken with safety; and in the less distant countries a sufficient stock is provided for the foundation and tolerably quick rise of future nations. Three hundred and sixteen years from that era to the call of Abraham appear from such not inconsiderable beginnings amply sufficient for the population represented to us in the writings of Moses, in the age of that patriarch; especially if we take into the account the life of man yet more than double to that of the present times. In his days the most fertile valleys only are peopled, and that not fully; great tracts even after his death are unoccupied. If we already perceive petty states, kings and conquerors, they would certainly appear insignificant in a more advanced stage of the world. The appearance of things neither requires nor would justify those numbers to which 300 years more, given by the Samaritan chronology to this second part of the period, would have necessarily increased mankind, and much less that abundant population which 600 years bestowed on it by the Septuagint version must have produced. By the very different face of the same countries represented to us by Moses in his own times, that author, ever consistent because ever true, shews us what an astonishing difference the progression of a few centuries makes in the numbers of mankind. From colonies originally composed of some thousands, and who from the beginning

ning settled in civil life, a series of 982 years seems fully adequate to a numerous population, and sufficient for the entire formation of a great number of small states, arrived in that space to considerable maturity. None of these however appear as yet so overgrown, or so superior to their neighbours, as to be enabled to exert very extensive sway. In those more distant and less favourable regions where the first colonies during their tedious emigrations dispersed in very small bodies, and from habit acquired a taste for a pastoral or roving life, the arts of civil life are lost, and the increase is consequently very slow. These countries remain almost desolate, and are not heard of till the next epoch, after which they are successively visited and civilized by more polished nations.

During the ensuing period, comprehending 984 years, from the conflicts of nations beginning to press on each other in Asia, or from the spirit of adventure, Europe, till then rather overrun than inhabited by wandering barbarians, receives at various intervals its first civilized colonies from Asia or Egypt. These are multiplied and extended to more distant parts during the course of three or four centuries. In the beginning of this period we must again recur to holy writ to dispel the obscurity and confusion of the incoherent and mutilated annals of the most learned nations. The mistaken principles of the first Grecian chronologers, when corrected, help to shew how much the corresponding events of Egypt and Asia have been antedated by their priests and historians. In the first two centuries

we see indeed several kingdoms arrived to a great degree of power ; their capitals, Nineveh, Babylon, and Thebes, are become objects of admiration by their magnitude and riches. Barriers to each other, the rising power of Lydia bounded their influence on the side of Asia minor : the two first were almost unknown on the western coasts of that country in the days of Homer. Independent of them all, the industrious and opulent Tyre covered the eastern as well as mediterranean seas with its commercial fleets, and scattered colonies on every coast, to enrich itself and civilize mankind. It is not till after the transitory glory of the Jewish nation, that these powers begin by turns to ravage Asia. Sir Isaac Newton has clearly shewn that Sefac must be the Sesostris and Bacchus mentioned by the Egyptian and Grecian historians. Under the last title his age coincides with that of the Grecian heroes, with whom he is said to be contemporary ; and it is evident that no very extensive conquests in Asia are owned by any other people before his time. Although his are not durable, Egypt becomes potent from that era. The same learned author has, by a minute examination of the genealogies compared with the facts announced in Grecian history, and by a reduction of the reigns of the several kings of that country to the standard of nature, invincibly proved that its first chronologers had antedated between two and three centuries both the foundations of its cities and the events recorded as part of its early annals.

Though antedated by the Greeks, it appears that the two deluges
O of

of Ogyges and Deucalion should be placed towards the commencement of this second epoch. The last of these seems in Grecian story to have been the most disastrous, and has consequently been confounded by their poets and mythologists with the universal deluge: which only shews how prone they were, like the Egyptians from whom they in great part descended, to confound the comparatively recent events of their own country with the much more antient ones of the world itself. If it really corresponds with the age of their last hero of that name, I should apprehend it not to have been occasioned by the opening of the straits of the Dardanelles, but by the irruption either of the lake which, according to Herodotus, antiently covered the plains of Theffaly, or that of other lakes which he supposes, from the indications of nature in his time, to have existed in some of the opposite valleys of Asia minor. Some such disaster on that coast probably occasioned the deserted state in which Dardanus found it on his arrival. The still more considerable deluge which must have been occasioned by the irruption of great part of the waters of the Euxine sea, I should conjecture to have happened much earlier, and towards the era of Jacob. These remarkable events I shall perhaps discuss more amply under another head.

The first conquests of Assyria are, according to Herodotus, to be dated in 1206 before Christ; but from concomitant facts it is evident that the great Assyrian empire arose not before the eighth century preceding the Christian era. Had it been very considerably

sooner, Sefac could not have so rapidly conquered the greatest part of Asia. The foundation of Rome, antedated by the Romans, could not take place till near a century after. To the very end of this period, remaining an inconsiderable state, struggling with no less inconsiderable neighbours, it as yet shewed no signs, except by the unconquerable firmness and courage of its inhabitants, of becoming, two centuries after, the mistress of the western world. She was inferior both in point of antiquity and early growth to her rival Carthage. Syracuse too, which outstripped them both by its rapid progress to splendour and magnificence, and which was, in about a century after the termination of this period, the great bone of contention between these two mighty contenders for universal empire, preceded her in point of date, and very greatly in point of early importance. Greece, though it had already produced a Homer, was yet preparing itself slowly for that career of every glory which it attained before the end of this period. That Sicily which appears to have been almost desert in the time of Homer, seems, towards the latter end of this time, to have been the most populous and the most envied spot on earth. It successfully emulated Greece in elegance and in science, and surpassed it in opulence. China, whose early superiority to all other nations has been erroneously boasted, had certainly not yet attained the prosperity of Asia or Greece. Confucius, its greatest genius and philosopher, was born about 550 years before Christ. In his time its southern parts seem little known, and its northern divided into petty states: but at that time Asia and Egypt were covered with

magnificent cities and the noblest monuments of art and industry. Greece had not only produced the most sublime poets and much more eminent philosophers and legislators before his time, but in the succeeding age a crowd of worthies and great men, whose talents in every kind have never been surpassed. One hundred and fifty years before the conclusion of this period, the small but vigorous states of that heroic land, combined by danger, had resisted by unequalled courage and superior skill the mighty efforts of the greatest power which had yet been seen in the world. Elevated by this successful exertion, that country, the favourite child of nature, rose to a height of glory in arms, in arts, and literature, unparalleled yet in any age or nation. Its haughty spirit of independence at length subdued by the crafty politics of Philip of Macedon, who had taken advantage of its internal jealousies and contentions; these very Greeks are led as subjects by his successor to avenge the common cause, and to overthrow, almost in an instant, that overgrown empire which had formerly threatened them with abject slavery.

From the rapidity of Alexander's conquests he is handed down to posterity as the model of conquering heroes. To judge from the few greatly conceived establishments time allowed him to make, he would perhaps, had not an excess of vanity and intemperance clouded and shortened his days, have been transmitted as the much more enviable pattern of beneficent monarchs. Irritated by desperate resistance, he had finally destroyed Tyre, who transferred the
greatest

greatest part of her commerce, and her establishments in Spain, to her daughter Carthage, who thenceforward rose with astonishing rapidity. The whole period ends with the rise of the Grecian empire in Asia and Egypt, which, from that era to this day, became subject to foreign rulers. Fifty-nine years before the fall of Persia, Rome had narrowly escaped annihilation from an army of Gallic barbarians, who, about three centuries before, had begun to pass the Alps of Savoy and Tirol, and by degrees possess themselves of northern Italy. Debarressed, by the sacrifice of the little gold she possessed, of these dangerous invaders, Rome in a very few years after, by the steady pursuit of a settled plan of ambition, had nearly made herself mistress of southern Italy, and first began to attempt a footing beyond it, in Sicily. This had like to have embroiled her with a more dangerous foe, the successor of Alexander in the kingdom of Macedon; but from this danger too she was happily relieved by the versatile pursuits of this wild adventurer. Less than two centuries more carried her to the full zenith of power and glory.

To shew that the lapse of time, 1936 years, here allowed, between the first settlement of nations consequent to the dispersion, and the conquests of Alexander, is amply sufficient for the vast population and the great progress of culture, arts, and opulence observable in Asia at the close of these two periods, it may not be amiss to observe, that the alterations in all these respects effected in northern and western Europe, and particularly in our own country, within

within a space shorter by near a century, from Julius Cæsar to the present times, are almost as great. Were the climates and fertility of these parts of the world as propitious to the increase of mankind as those of western Asia, and had not the natural progress of civilization and cultivation been retarded several centuries by the irruptions and ravages of barbarians after the downfall of the Roman empire, there is little doubt but that the advances these parts of Europe might have made, would have been fully equal to those of Asia in the space I have assigned. Fully to prove the rapid progress occasioned by a greater degree of civilization in any country, let us notice that Russia since 1717 has more than doubled the number of its inhabitants, and much more than doubled its importance since the beginning of the present century; and, should no great calamity intervene, must rise still more rapidly in the next.

From these observations, and this, I flatter myself not ill founded, critical review of history and chronology, I am persuaded that it will appear that 2698 years between the deluge and the Christian era form a sufficient space of time for the full population of all the parts of the western world of which any tolerable knowledge was acquired at the birth of Christ. Germany and all the northern parts of Europe were even then still covered with forests, and of course thinly inhabited. In this chronology ample time is allowed before the dispersion for such an increase as would enable men, who settled in Asia in civil society, to build numerous towns and cultivate their
environs.

environs. In the remainder of the first period, the first progresses of population are sufficiently slow and gradual, till at length all the habitable parts of western Asia are fully occupied. A greater length of time is not only not requisite, but would be superabundant for this situation. It is not till the second period that some overgrown nations begin to press upon their neighbours, and that population in those parts begins to exonerate itself by seeking settlements in neighbouring, but as yet almost unoccupied, countries. From all these considerations I will boldly conclude, that any further extension of time is totally unnecessary, and that a much greater would be absolutely incompatible, not only with authentic history, but with the course of nature.

NOTES AND ILLUSTRATIONS

TO

LETTER I.

(a) Page 5.

I SHOULD be apt to compare the difficulties which occur in unravelling the history of antient nations, to those we find in arranging into order the ruinous remains of some antient Greek or Roman monument of architecture. A heap of stones, mutilated columns confusedly dispersed or encumbering each other, interrupted traces of foundations, bewilder the ideas of an impatient or unlearned traveller, and give him but a faint idea of the magnificent whole. But should it happen to be examined by a real connoisseur in the art, this confused chaos resumes, if not its first beauty, at least a part of that noble design which was once the admiration of the world. A few broken shafts long fallen from their mouldering pedestals, half-buried fragments of frizes and architraves, indicate to him the different orders which once adorned it: here and there traces of foundations point out the extent and form of the edifice; what is wanting on one side is happily re-discovered on another; and the grand whole arises anew under the pencil of the expert architect. It was thus that Michael Angelo restored with probable truth the plan of the famous temple erected by Sylla, on the mountain of Præneste, to that Fortune which had always favoured him. The slope of the hill, of more than a mile, cut into terraces, formed the grand steps to that awful

P

edifice.

edifice. Each terrace was decorated in its peculiar style of architecture; had its pavilions, its gardens, pieces of water, and fountains; and upon the summit rose the temple itself, adorned by its portico and colonnade forming a semicircle. Michael Angelo has given designs which represent the whole, and has constructed upon the foundations of the temple a villa which recalls its idea. There he fortunately discovered and preserved entire, without derangement, the tessellated pavement which was brought by Sylla from Corinth. It represents, as is generally supposed, the expedition of Alexander into Egypt and to the temple of Jupiter Ammon; but I should rather think, some event of more ancient date. What is perhaps the most remarkable in it, is the similarity of the landscapes, of the buildings, of the boats, and of the habiliments of men and women to those we now see on Chinese papers. I infer not from thence, with Mr. Needham, that the old Egyptians and Chinese were sister colonies, or directly sprung the one from the other; but that they alike, as well as the Indians, were singularly tenacious of their ancient manners, customs, and even modes of dressing. I think, with him, though the idea was strongly combated by the philosophers of the time, that the characters of the tables of Isis preserved at Turin are, as he attempted to shew, very similar to those of China, and, perhaps it might be found, no less so to those of the Sanscrit language. A species of hieroglyphic writing, such as the old Egyptian and present Chinese characters, I am apt to believe an antediluvian art. Notwithstanding the variations in language, wherever it was preserved, I think it likely to have been continued with very slight alterations. It was superseded and thrown out of general use in those countries where a more commodious alphabet was invented, but in many was still appropriated to monuments and sacred writings.

(b) Page 6.

The ancient history of Greece abundantly shews us the weakness as well as frequency of these first colonies, generally composed of bands of adventurers from the different coasts of Asia and Egypt, of unsettled pirates frequently transplanting themselves from one island or country to another.

Before the siege of Troy eight such different crews had, at divers times, seized some parts of the sole island of Eubœa. Nearly the same may be said of all the other islands of the Archipelago, and of all the coasts of Greece and Asia minor. From Phœnicia a set of men called Curetes, skilled in the arts of that country, settled, some in Phrygia, where they were called Corybantes; some in Crete, where they were called Idæi Dactyli; some in Rhôdes, where they were called Telchynes; some in Samothrace, where they were named Cabyri; others in Eubœa, in Lemnos, in Imbrus, and many in Ætolia, from thence called the country of the Curetes. No sooner was a regular government formed in Crete by Minos, than, impatient of controul, part of these adventurers passed over into Caria and Lycia. The Dorians, Ionians, the Æolians, originally from Phœnicia, under the more general name of Pelasgians, seized on various parts of Greece; but part of these soon after re-transplanted themselves into Asia minor, whilst others tried their fortunes in Italy. The Cypriots were partly derived from Phœnicia and Egypt, and partly from Arcadia, from Salamine and Athens. We shall hereafter shew, that these frequent first emigrations of adventurers from Asia and Egypt, who first brought culture, arts and letters into Greece, composed of 50 or 100 men at a time, the crews of one or two small vessels, were occasioned either by the expulsion of those shepherds from Egypt, who, on the retreat of the Israelites, had seized on Abaris or Pelusium, or by the conquests of David king of Judea; and that they date not beyond the 13th century before Christ.

(c) Page 7.

The minutest circumstances equally serve as matter of even contradictory cavil to those who, in consequence of their doctrines, think themselves obliged to keep the date of the world out of sight. Voltaire impeaches the veracity of Moses, because he describes some arts pretty far advanced amongst a people whom he styles barbarians. He doubts whether the golden calf, however rudely cast, could have been executed within the same time even by the expertest artist of Paris. He forgets that this same Moses, the law-

giver as well as historian of these savages, had given them a code of laws, both moral and political, infinitely superior to those of Lycurgus, Solon, or Plato, the boasted sages of Greece in her most enlightened periods. Others from this early perfection of some arts infer the antiquity of the world. But, as I have remarked, in settled sedentary nations in happy climates the arts may make hasty strides. Accidents frequently give birth to them, and a few great geniuses carry them at once from the very cradle to full maturity: Noah lived 350 years after the deluge; and from him and his sons mankind, yet living together at no great distance from the place of his descent, must have learnt, and might easily preserve, all the arts invented during sixteen ages before the deluge. In those former happy times, had they not been shortened by the crimes of man, the same persons might have pursued and perfected their discoveries during several centuries. What gigantic strides in the career of science would not an Euclid, an Archimedes, a Descartes, a Leibnitz, a Newton, have made, had their lives been prolonged to 800 or 900 years?

(d) Page 8.

Diodorus Siculus says, that the Egyptians taught, that birds and fishes were first generated from the waters, animals and lastly man from the slime, of the Nile; men having, according to them, first existed in Egypt. These men, struck with and admiring the beauty of this world, imagined the sun and moon to be the two only eternal gods of universal nature, whom they afterwards denominated Osiris and Isis. By these all things were generated, and are nourished. All nature consists of five parts; vital spirit, which they called Ammon, or Jupiter; fire, called Vulcan; the earth, or aridity, the vase which receives, Rhea; humidity, called Typhon, or Oceanus; and finally air, called Glaucopis, and by the Greeks, Pallas. From these gods the Egyptians pretend others were begot, who were however mortals, but for their wisdom and benefactions to mankind adopted into immortality. These reigned in Egypt, some assuming the names of the gods, and others preserving their own proper names. These were the Sun, Saturn,

Saturn, Rhea, Jupiter or Ammon, Juno, Vulcan, Vesta, and lastly Mercury. The first king in Egypt was called The Sun, from the name of that divinity; but other priests affirmed that Vulcan, the inventor of fire, was their first king; then Saturn, who took to wife his sister Rhea; from whom, according to some, Osiris and Isis, and in the opinion of others, Jupiter and Juno, who, on account of their virtues, reigned over the whole world. These produced five gods, Osiris, Isis or Ceres, Typhon, Apollo, and Venus, whose names were given to the five intercalary days of the Egyptians. Typhon, Hermes or Apollo, and Mercury, were by Osiris set over parts of his extensive dominions and conquests. His other generals and ministers were Hercules, Antæus, Busiris, Prometheus, his two sons Anubis and Macedon, Chemnim or Pan expert in husbandry, Maro in planting of the vine, and Triptolemus who first sowed wheat. Chemnim seems to be the same as Cham. Osiris, slain by his brother Typhon, probably adverting to the first men being drowned in the waters, was succeeded by his wife Isis, and after her by his son Orus, to whom also, Diodorus says, belongs the name of Apollo. The confusion of names is worthy of notice, and no less so that of times; for it is evident that many of the companions of Sethos or Bacchus, who lived not long before the Argonautic expedition, are here given to Osiris. The latter Egyptians, to gain credit, had jumbled their fables with those of the Grecians, as these had more antiently adopted to themselves those of Egypt. The same author assures us, that the Egyptian Orpheus, to gain more easy admittance to his doctrines and mysteries amongst the Greeks, had transferred the Egyptian Hercules to their country, by making him born of Semele, the daughter of Cadmus, by Jupiter. This surname was afterwards given to the son of Alcæus. The same author testifies, that many gods were afterwards made out of one. For Isis was called Ceres, Thesmophoras, Luna, Juno, &c. Osiris was by some called Serapis, by others Pluto, Dionysius, Ammon, Jupiter, and Pan.

(e) Page 10.

It is very possible that the true origin of the name of Osiris may have been derived, as hinted by Diodorus, rather from the star Sirius, or Syris, whose rising preceded the inundations of the Nile which annually fecundated Egypt, than from the sun; but it appears, that in later times he was taken for the sun, as was his wife Isis for the moon.

(f) Page 11.

The learned world is much indebted to Mr. Court de Gebelin for one of the most astonishing works which has perhaps appeared. His primitive world is not only fraught with an immense store of learning, embracing the whole circle of human knowledge; but, what is still more rare in the writings of men of erudition, is no less remarkable for elegance and literary taste. He has thrown a light upon the mythology, the fables, manners, and customs, of high antiquity, which we could have scarcely dared to hope for. He has penetrated and unveiled the allegorical genius of the orientals. By profound and methodical study he has seized with admirable sagacity the key of all languages, antient and modern, and seems to have fully proved that they have all one common source, and the same primitive roots slightly varied by accent and pronunciation; and from thence has deduced a new universal grammar applicable to all. But, as it generally happens to those who have discovered a happy secret, I am persuaded he has frequently extended his allegorical system beyond its due bounds. I believe with him that the gods, pretended by several nations to have first reigned over them, were in the origin mere allegorical beings; but I think that they frequently also gave to their true chiefs and founders those names which denoted these imaginary beings, confounded and identified with them in succeeding ages. We yet observe savages giving to their chiefs the surnames of the sun, the lion, the wolf. The antients moreover represented them to posterity under shapes belonging to such allegorical names. If Mr. Court does not entirely erase from history, he at least renders doubtful, the existence of the acknowledged fathers of nations. The reason which he assigns is, that
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their names are significative of the progresses of society ; but they also denote the necessarily progressive labours of their successive institutors, which must needs be the same in all infant societies. Every where there must have been a chief who first gathered together, or conducted, the new colony ; another who provided for its security in its new settlement ; a third who endeavoured to protect its prosperity by laws : and these different cares, in colonies as yet isolated and feeble, require the whole life of more than one chief. We perceive in scripture that it was not always their contemporaries, but their posterity, who conferred on men names characteristic of the principal events or traits which distinguished their lives. It is thus that the Phrygians gave to the person who first led the colony into the country the name of Dardanus, by Mr. Court interpreted, base or foundation ; to him who gave it laws, that of Eric-ton or legislation ; to those chiefs who built and fortified its capital, those of Tros and Ilus ; to the sage who regulated the labours of agriculture, &c. the appellation of Lao-medon ; and to Priam, who saw in his life-time his kingdom both flourish and come to an end, the name of Priam, indicative of both these events. Every where the first chiefs received surnames relative to the progresses made under their auspices, and these must have been nearly the same in all beginning settlements. It is for times preceding the eras of these true founders, that nations, to hide the weakness and recency of their origins, devised the idea of making themselves descended from imaginary beings, and to have had the sun and moon, and other great objects and powers of nature, for their sovereigns.

(g) Page 12.

According to the opinion of Mr. Bailly, formed on a formal passage of the Begavedam, the years of the first Indian ages are to be reckoned as so many days. As is judiciously remarked by the same author, the same computation must have taken place amongst the Chaldeans. Their astronomical observations, which according to Epigenes comprehend 720,000 years, are by Calisthenes reduced to 1903 solar years. The chronicle of Alexandria shews, that the Egyptians computed the reigns of their gods
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by years of 24 hours. Diodorus of Sicily tells us, that the gods of that country, who succeeded Vulcan and the Sun, reigned more than 1200 years, and their deified successors 300 years; but that the years of the first are probably so many moons, and the second are to be reckoned by the three Egyptian seasons, spring, summer, and winter; the real duration of all these reigns equally making about 100 solar years. Pliny and Plutarch attest the same thing. These different years also obtained amongst the Chaldeans, Persians, and Phœnicians. The Egyptians as well as the Chinese sometimes also computed by years of 60 days; the Arcanians by years of six months, which are yet in use in Kamchatzka. I owe to the learned researches of Mr. Bailly this general view of different years employed by early antiquity, at different periods, which however it is impossible to fix. Thus confounded in ancient chronologies, how is it possible to reduce their pretended dates to one common measure? We ought not to forget that the year of 360 precise days, which not only was the antediluvian year, but I am persuaded was the then true computation, at one time prevailed universally. As I shall hereafter endeavour to shew, men, soon perceiving that it no longer belonged to the renewed earth, strove at various times to find other computations which might bring it nearer to the real duration of its present revolution round the sun.

(b) Page 13.

Nothing, one would think, could so efficaciously humble the presumption of self-conceited philosophers as the reflection, that there is no absurdity so great as not to have been seriously maintained by some one person of uncommon talents. When the memory of the works of the Creator was gradually obscured or obliterated, or rather when the crimes of men made it convenient to escape from the idea of one perfect, invisible, and omniscient witness, it is not to be wondered that they should substitute in his room some of the most obvious objects of nature, such as the sun, whose beneficent influence was certain, but whose distinguishing and remunerating powers were dependent on the momentary imaginations of their adorers.

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The hopes and fears of man soon multiplied these fancied deities, and adulation admitted mortals into their partnership. The first philosophers of Greece were too sagacious not to perceive the absurdity and inconsistency of Pagan mythology; but the pride of reasoning prompted them to seek the explanation and means of creation, not in the existing powers of nature, visibly calculated merely to preserve, totally inadequate to the production either of old or new matter, but in their own exalted imaginations. Some few saw, but through a cloud, the necessity of an intelligent superintending architect for the construction of so many complicated machines equally admirable in their particular structure and minute perfection, and in their general end for the support of one great stupendous whole; but vulgar prejudices and philosophical pride were too powerful for them alone openly to withstand the torrent. More culpable than the first, in the midst of irrefragable light thrown both on the great cause and the works of the creation, the philosophers of this age seem to wish to plunge us again into the abyss of senseless plastic nature, of concatenating atoms, and fortuitous generations. Great have been the modern discoveries in natural history. To a certain extent we have learned to decompose and amalgamate some of the compounded substances of nature; on some of the properties of these we can reason right or wrong: but no one has or will be able to subtract, or add, or even to define, one particle of primordial matter. The original impulsion of motion, which varies or renews its form within stated and impassable limits, cannot be found in nature alone.

(i) Page 14.

The Etrurians, according to Suidas, held that God, the author of the universe, employed 12000 years in all his creations: that in the first chiliad, or 1000 years, he made heaven and earth; in the next, the firmament which appears to us, calling it heaven; in the third, the sea and all the waters that are in the earth; in the fourth, the sun, moon, and stars; in the fifth, every volatile, reptile, and four-footed animal in the air, earth, and water; in the sixth, man. It is impossible not to remark how exactly this coincides with the Mosaic account. According to the Persees, God created the world

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in six times, called Gâhanbârba, making in all 365 days. The first time is called Mîd-yû-zeram, and contains 65 days, in which the heavens were created : the second Mîd-yû-shahem, of 60 days ; in this the waters were created : the third, Petî-shahim, consists of 75 days, wherein the earth was created : the fourth is Iyâseram, of 30 days, in which the trees and plants were produced : the fifth is Mide-yârin, containing 80 days, in which space the animals were created : the sixth, Hames-pîta-mîdîm, of 75 days, wherein man was made. Vide Univ. History. The antient Brachmans and modern Bramins describe the successive creation of all things in the same order. Ovid's description of the creation differs but little in essential points from that of Moses ; and, though taken from the Pagan mysteries, seems, like the foregoing, moulded on the same base of no doubt universal tradition in the first ages. The allegorical mythology of the Pagans has only obscured and disfigured the truth.

(j) Page 14. line 18.

Besides these ten generations, the Chinese chronicles talk of ten families or Ki of Gin-hoangs, kings of the earth, who reigned together, and furnish a long list of generations. Who are these kings of the earth ? Are they not the antediluvian patriarchs, who, on account of the length of their lives, may almost be said to have lived at the same time, and must have seen in that space numerous generations, their own progeny ? In that case, the second ten generations between Fohi and Yu must represent not the antediluvians, but those from Noah to the founder of their monarchy, who by this means becomes contemporary with Abraham. With the Chinese, as with other nations, antient history is buried in a confusion from which we cannot extricate ourselves but by conjecture. I am apt to think that Fohi is sometimes taken for Adam, and sometimes confounded with Noah the restorer of mankind. They pretend him born after the 10 Ki Gin-hoangs, kings of the earth, and at the very commencement of the present age, preceded by a deluge ; and yet they speak of him as the first of men. It appears to me, that Adam is more generally meant by this Chinese Fohi. They repre-

sent him with the body of a serpent, because, say they, he was formed from the dust of the earth. This characteristic belongs to none but Adam. The Chinese chronicle called Siao-ul-lun places Fohi at the head of the nine Gin or nine Min of the august family of men. This family begins immediately after those of the heavens and of the earth; which families appeared immediately after the liquid mass, whose birth terminated the Tayku, or the highest antiquity. Here again he may be Noah succeeding the antediluvian kings of the earth; or else this whole passage may indicate the creation of man succeeding that of animals, which was preceded by the creation of the stars or celestial bodies, after the formation of the abyss or chaos, which terminated anterior eternity. Whichever explication we follow, the analogy of this cosmogony with that of Genesis is striking. Let us also observe, that the name of Kua, given by this chronicle to the wife of Fohi, has a near resemblance to that of Chaua, the Hebrew name of Eve, and has, as it is said, the same signification. The Persians fall into the same confusion between Adam and Noah. Soliman-Haki seems to represent the first. They pretend Caiamurath to have been the son of Adam, and place him amongst the nine generations who followed him, to the deluge; but still they make him the founder of their monarchy after that event. The traditions of the Tartars place him without confusion as contemporary with Turk, grandson of Japhet. In appretiating these Chinese and Persian chronicles, it should seem that Fohi, whom the former claim as first monarch of China, which they ever confound with the whole world, is Adam; and that Caiamurath, styled by the Persians their first king, is Seth. Yu and Caicobad seem to be the same with Noah: though possibly Yao, whom the Chinese look upon as the second founder of their empire, and whose name has much resemblance with the Hebrew Noach, may be that patriarch; or, notwithstanding this similitude in name, he may be the real personage who first settled in China, a descendant of that restorer of mankind nearly in the same degree as Caiamurath and Turk. It appears to me that the Chinese, having lost the true thread, though not the entire memory, of their traditions, have often confounded the histories of Adam

and Noah, and have arrogated them to themselves as monarchs of China. Sensible however that these did not belong to them exclusively, they have, like the Persians, preserved a distinction between these fathers of mankind and those kings who really reigned in their country, of whose dynasties that beginning with Yu is invariably styled the first dynasty; and dates, according to their best chronologers, 2217 years before Christ, 161 years before Abraham, and 80 years after the dispersion. It may without improbability be the date of the first occupation of China.

(k) Page 15.

In appretiating Moses merely as an historian, he must surely be ranked in the first class. His style, often sublime, is ever clear and simple. His candour has few or no example. His own faults, those of his brother, or of his people, are not disguised; but spite or ill humour never appears in his writings. As the work of a philosopher and legislator, it cannot be denied but that his decalogue is the most able, clear, and complete abstract of all the duties of man. The government he established is a model of liberty and wise foresight; his laws of police admirable; his legal ceremonies well calculated to unite the citizens of the same family, to inspire them with the love of their country, to guard the adoration of one God amidst surrounding idolatry, and to preserve the people from distempers incident to the climate and their peculiar habits of body. But he called himself inspired, he pretended to work miracles, say philosophers, which we cannot admit possible; by extraordinary prodigies, which we call tricks, he deluded a whole people during 40 years; and he has the insolence to consign them to posterity! It must be owned at least, that these daily wondrous delusions during that long space required a knowledge, an art, a dexterity not very common. The question of their truth or falsehood is, I believe, oftener decided by the heart than by the head. What perhaps is the most extraordinary in all this, is, that all these prodigies had little lasting effect on this stiff-necked, or, it might be said perhaps from their incredulity, philosophical people; and that Moses, regardless of his own honour or justification, does not in the least dissemble it.

Without

(l) Page 19.

Without recurring to forced etymologies, the names of almost all ancient nations shew their descent from the fathers assigned to them by Moses. The Assyrians owe theirs to Assur, long deified as a god, and assumed as a title by their kings not seven ages before Christ. Persia was long called Elam in the East, and Elymæ and Elymais are often mentioned by the ancients. Syria in the country itself long retained the name of Aram, from whence Aramea. Media still preserves that of Madai; Chusistan has retaken that of Chush; Iavan (Iovan in the Greek translation) seems the same as Ion the father of the ancient Greeks. The Thracians derive their name from Thyras; the Lydians, from Lud; the Mæsiæ and Getes, from Mes and Gether; and from their union sprang the nation of Messagetes. The name of Riphath is preserved by the Rhyphæan mountains. Dodanim, or Rhodanim, as the Greek version testifies, was the father of the Rhodians, and possibly of the Dodonians emigrated from thence. Heber was the father of the Hebrews, and, as it is thought, of the Iberians. Sydon gave his name to the very ancient city of Sydon, mother of the famous Tyre. Hadramuth, part of Arabia Felix, derives its name either from Hatfarmaveth, or as I should rather think from Hadar, son of Ishmael: and in the same country an ancient town was called Baifat-Jocktan, or House of Joctan. Arachosia, mentioned by Strabo, near Indostan, probably derived the name from Jarach. Ludiim, or Lehabim, has left his name to Libya; and Phut gave his to a part of Mauritania antiently called Regio Phutensis. Tobolsk, or Tubalsk, still retains the memory of Tubal, from whom also probably formerly the Tiballians.

(m) Page 19.

Medals certainly convey a more authentic proof to posterity of the general and most approved opinion of the times wherein they were struck, than can be derived from the writings of historians. A coin struck at Apamea (formerly Cibotus, a name expressive of the event) in honour of Philip the elder, has on the reverse the representation of a kind of ark or box upon the waters,

waters, containing two persons, man and woman, and two others already landed from it. On the top of the ark sits a dove, and above it another dove holding a small branch in its beak. On the ark itself is engraven very distinctly NOE. This medal is in the collection of the duke of Tuscany. Anaxagoras says, that Nous was esteemed by the Egyptians the renewer of mankind; by Suidas he is called Nannacus; in the East, Noas, Noasis, Nufus, and Nus; and by the Greeks compounded Dio-nufus, the god Nufus. Philo Judæus says, the Grecians call the person Deucalion, but the Chaldeans stile him Noë, in whose time happened the great eruption of water; they also call him Xisouthros. By Abydenus, quoted by Eusebius, writing from the authority of the archives of the Medes and Babylonians, Noah is called Scifithrus. He says, that the flood began the 15th day of the month Desius, the second month; that during the prevalence of the waters Scifithrus sent out birds that he might know if the flood had subsided; but that the birds, not finding any resting-place, returned to him again. This was repeated three times. On the third trial the birds were found to return with their feet stained with soil. Upon this he quitted the ark, and was never more seen by men, being taken away from the earth by the gods. The place of descent is by him said to be in Armenia. This Scifithrus of Abydenus is called Xixithrus by Berosus and Apollodorus. Plutarch de Solertia Animalium mentions the Noachic dove. Lucian de Dea Syria says, that the present race of men are different from those who first existed; for those of the antediluvian world were all destroyed and doomed to destruction on account of their crimes. For this purpose there was a mighty eruption of waters from the earth, attended with showers from above. The whole earth was covered, and all flesh drowned. Deucalion alone was preserved in a vast box; animals of every species followed him in pairs, and were received into it. He supposes the scene Hierapolis. The rainbow which appeared to Noah as a sign or covenant, is mentioned as a mysterious and lasting sign to desponding man by Homer; and according to him and Hesiod the gods swore by Iris, or the rainbow. Vide Bryant's Mythology. Plutarch has preserved to us an anecdote very similar to one of the above-mentioned

mentioned circumstances. He says, that the Egyptians celebrated the 17th day of the 2d month as the anniversary of that in which Osiris was forced by Typhon, or the sea, to take refuge in a boat. Alexander Polyhistor, Abydenus, Eupolemus, relate the reunion of mankind after the deluge in the plains of Sennaar, the building of Babel, the confusion of languages, and the dispersion of men. The latter says, that the city Babel was first built, and afterwards the celebrated tower; both which were built by some of those people who had escaped the deluge: they were the same who, in after times, were recorded under the character of giants. The tower was at length ruined by the hand of the deity, and these giants were scattered over the whole earth. Mr. Bailly informs us, that the Chinese talk of a certain Peirun, and the Swedes of a Belgemer, who saved themselves in a boat from a general inundation.

The ship of Isis was called Baris, which, according to Nicolaus Damascenus, is the name of the mountain (the same as Ararat) on which the ark rested. His words are—There is a large mountain in Armenia, called Baris; to this it was said that many people betook themselves in the time of the deluge, and were saved; and there is a tradition of one person in particular floating in an ark, and arriving at the summit of the mountain. Sesostris is said to have dedicated a magnificent ship, of 280 cubits in length, to Osiris in the temple of Thebes. It is remarkable that the Hebrew name of the ark is Theba, whence probably both the Thebes derived their names. The sacred Ogdoas, carried at certain times in procession by the Egyptian priests, was a boat containing eight persons, the most ancient gods of the country. The Chinese character denoting a boat, is composed of the representation of a ship, of a mouth, and of the cypher 8. Vide Bryant's Mythology.

In the dissertations relating to Asiatic antiquities we find, that the seventh Menu of the Hindus, surnamed Vaivaswata, was saved with seven Rishi's and their wives from an universal deluge, which is the subject of the first
Purána

Purána or sacred poem. In the story, as told in the Bhâgawata, it is related with many absurd and marvellous circumstances, that the god Vishnu sent to Satyavrata a capacious vessel miraculously formed, in which he with the seven pious Rishi's and their wives, with pairs of all animals, were preserved from the general flood. The god himself, in the shape of a vast fish, suffered the vessel to be tied with a great sea serpent to his horn. Vishnu afterwards appointed him the seventh Menu, by the name of Vaisvata. In the same dissertations it is asserted to appear from works of undisputed authority, that the Chinese, as well as the Hindus, believe this earth to have been wholly covered with water just before the appearance of Fo-hi on the mountains of Chin, but that the great inundation in the reign of Yao was confined to the low lands. From circumstances which I have already noticed, I rather think Adam to be meant by Fo-hi; that the first inundation here spoken of is relative to the waters covering the earth on its first creation, and that the deluge is pointed out by the second under the reign of Yao, who probably represents the Noah of the scriptures.

(n) Page 20.

At the time of the conquest of South America, the inhabitants of Mechacacan, of Thlascale, and the people called Achagna, yet preserved the tradition of an universal deluge in punishment of the crimes of men. The first of these held, that a priest called Tezpi was saved from it by retiring with his wife and children into a great box of wood, in which he had also gathered together a great many animals and excellent seeds of all sorts; and that after the retreat of the waters he let fly a bird, called Aura, which returned not back, and successively several others which also came not back; but that the least of these birds, that which these Indians esteemed the most, soon appeared again with the branch of a tree in its mouth. *Histoire Générale des Voyages*. A native of Cuba said to Gabriel of Cabzera, Why dost thou abuse me, since we are brothers? Dost not thou descend from one of the
sons

sons of him who built the great box to save himself from the waters: and are not we descended from the other? Vide Herrera.

(o) Page 20.

Ararat signifies Mountain of descent. It was also called Baris or Barit; Luban or Mountain of the Moon; likewise, Harmin or Har-men, or Har-minah, signifying the same. From thence the people round it were named Mimmi, or Minyæ; and the region, Armenia, or Armeni, from the mountain. Gogarene, a part of Armenia, signifies The place of the ark. The principal cities of Armenia were Arene or Carina, Area Comana, Ararathia, Cueousus, the place of Chus. See Hierocles. The mountain was likewise called Thamanim: compounded of the Hebrew words Theba, boat, and Shaman, denoting the number 8. According to Ebn-Patricius, the district below the mount was called Terra Thamanim, or the Region of the eight. William de Rubruquis, who travelled in 1253, mentions a town called Cemanim, by interpretation eight; and they call the mountain near it Mafis, or the mother of the world. Moses Choronensis says, that the true name of the town of Naxuan (the Naxuana of Ptolemy) is Nachidhevan, by which is signified the place of the descent of the eight.

(p) Page 22.

Mr. Bailly was not only an astronomer of great celebrity, but a very elegant writer. He was the distinguished disciple of Mr. de Buffon, who in conjunction with Voltaire, D'Alembert, Condorcet, and others, was at the head of the whole philosophic sect and men of wit in France, by whom a real plot had been formed, and was carried on for forty years, to root out Christianity. Religion of any kind, it seems, shackled both their inclinations and their genius. Each agreed in his separate department to contribute to the glorious work. For many years, in France, to be a man of science or of letters was a distinct profession and a distinguished title, which introduced the assumer to the fashionable circles of profligate nobility, and to the tables of ignorant and still more profligate publicans, fattened on the

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spoils of the people. The luxurious repasts of the rich were not complete without the presence of some of these sons of Epicurus. There, amidst their admiring auditors and a crowd of gaping valets, they expounded in sallies of wit and sarcasms on religion their pernicious doctrines, interlarding them with sentimental phrases of philanthropy and humanity. How much of these was in their hearts they have since fully shewn during the fatal reign of their philosophy. At the houses of every lady, young or old, whose ambition it was to be celebrated for wit, they held their conventicles, where they still more freely discussed their philosophical principles, and expatiated on the abuses of religion and governments. Whoever coincided not with them was, by universal acclamation, held up as a man devoid of sense or wit. The effect of this general cry is scarcely to be conceived ; with youth it was all-powerful, and with the more advanced in age it required very solid principles to be withstood. They had actually by degrees excluded from all the academies whoever dared not to be of their opinion. Though co-operating with these conspirators against religion, Mr. Bailly was distinguished as a man of benevolence, of modest and placid manners. He has been lately still better known to all Europe as the first mayor of Paris, in 1789. The spirit of party probably carried him beyond his natural bent ; but he became a fellow-labourer with the heads of the constituent assembly, who, under a shadow of monarchy, called in the mob, whom they acknowledged the sole sovereign ; and enforced the success of their revolution by calumny, terror, and partial murders, by the demolition of property and the confiscation of church-lands. At last, with every other chief of that faction who saved not himself by timely flight, Mr. Bailly fell a victim to more atrocious villains who had made use of these as tools, and to the ungovernable fury of that populace whose bloody reign they had established, in order to pull down regal authority, and level with the dust the religion and morality of their country. Many were, no doubt, surprised to hear of Pagan festivals, and rites instituted by the convention, in honour of the supposed goddess of nature, represented by a female : but the surprise will cease when they are informed, that these rites were, 30 years ago, secretly practised by a society

society of philosophers, to whom France owes what they have been pleased to style its regeneration.

Warned by the fatal effects these seducers have produced in one great kingdom, it is to be hoped that those who shall hereafter aspire to the respectable name of philosophers will henceforth abjure these insidious attacks on the principles of religion; and that governments will be cautious how they countenance or patronise those who shall thus aim to poison the truest source of public and private happiness. Without religion, that virtue which sophists wish to isolate from it is a mere abstract idea which has neither base nor real end: without it, no curb on vice remains, either over sovereigns, or over the headstrong multitude. Wisdom itself, without it, is only egotism well understood; and for the understanding of it the passions are the judges. Religion will ever be the sole solid support and strength of laws and public order; counterpoise to the inevitable inequalities amongst men, consolation of the poor and weak; it can alone dignify poverty, and subdue the pride of riches and of grandeur. Ever ready to pour its healing balm on the wounds of the body or of the mind, it is the surest solace of the afflicted, and the last refuge of the culpable. In vain would sophists seek to sap foundations rooted in the very inmost recesses of human nature; the intimate sense of every man of rectitude, and the heart of every man of sensibility, will, at times at least, triumph over their acutest reasonings.

Fulminate, ye philosophers (we will applaud you), religious persecution and restraint of consciences; with you, true religion reprobates them. If every predominant sect of Christians has at some period invoked their aid either under the pretext of danger to the state, or on the specious pretence of guarding from corruption the weaker part of the flock, none has dared to approve them in direct terms, because they are clearly repugnant to the spirit and to the doctrines of their divine legislator. As the judicious Dr. Paley observes, the erroneous judgments of intemperate zeal, almost ever originating in human passions, have too often produced intolerance

and persecution, nowise chargeable on Christianity: but the unbelieving rulers of France have proved that, in order to be a persecutor, it is not necessary to be a bigot—that, in rage and cruelty, in mischief and destruction, fanaticism itself can be outdone by infidelity. Amidst equal horrors, one essential difference is also to be remarked between these two kinds of persecutors. By the one, all the connections which bind mankind together are not dissolved: the ties of blood are sometimes trodden under foot; but against adverse tenets all his rage is directed; towards the brethren of his creed the bonds of amity, fidelity, and benevolence are strengthened. The other knows no brother, and every man who stands in the way of his idol passions is alike sacrificed with stoical indifference.

If philosophers wish to combat the most fatal and destructive error of mankind, it is against warlike phrensy that it becomes them to employ their strongest arguments, and their most touching eloquence to eradicate from the minds both of princes and of the people that rage of mutual destruction for senseless jealousies and mistaken interests. It was the Christian religion which first taught man to love man without distinction of race or country, by shewing all men to be the equally cherished children of one common father. Simple but sublime doctrine! which if antient philosophers ever felt, they never durst produce. Let philosophy unite to its mild voice the force of reason, to make the whole world listen to the lessons of true philanthropy. Whilst religion reveals to each individual eternal felicity attached to the accomplishment of this great precept of love, let it demonstrate to nations temporal happiness and prosperity dependent on universal concord.

(q) Page 22.

That we may be able to form some estimation of the intrinsic real merit of this Indian Chronology, which Mr. Bailly here holds up to us as a correction of ours, it will not be amiss to examine the foundation of the whole edifice of these Indian ages. I shall briefly extract it from the Tra-

vels of Mr. Sonnerat. The first age, called Creday-ougam, or of innocence, lasted 1,728,000 years; the second, Troday-ougam, 1,296,000; the third, Touvaberay-ougam, 864,000; and the fourth, Caly-ougam, or the age of misery, the present age, is to last 432,000 years. Intervals of 800, 600, 400, and 200 years follow each of the ages. The first base of all these terms is one instant of time diversely multiplied to 100 years, the full duration of human life; these 100 years are multiplied by 360, the number of days in the year, making 36,000 years, again multiplied by several mysterious or superstitious numbers to form the total duration of each age. These numbers are also calculated upon astronomical periods. According to the Bramins, the precession of the equinoxes is of 54 seconds *per annum*; whence they framed a cycle of 60 years, during which the fixed stars advance their longitude 54 minutes. They therefore advance 54 degrees in 3600 years, and will perform an entire revolution in 24,000 years. Nine of these revolutions make 216,000, which is also the produce of the period of 600 years multiplied by 360, according to the number of the days of the year: and that number multiplied by two, makes up the 432,000 years of the present age. The multiplication of that term by other mysterious numbers gives the several durations of the preceding ages. The year 1783 of our era answers to the year 4884 of this fourth age, and to the year which the Indians call Soupragedou, the 36th of the present cycle, which is the 80th of this age. Here either Mr. Sonnerat or the Indians seem to have made a small mistake, as the year 1783 should, according to this, be only the 4776th of the Indian age. Such being its foundations, can we seriously lay any stress on a structure framed upon a combination of arbitrary or superstitious numbers; one of whose numbers, that of 360 as the number of days in a year, is evidently erroneous with respect to the actual revolution of the earth? It will be well however to keep in view, that this number of 360 days forms in every antient nation the first and earliest calculation of the year. However erroneous or uncertain our chronologies may be, can we seriously dream of rectifying them from such calculations?

(r) Page 23.

The three chronologies of the Bible differ considerably as to the length of the antediluvian age. The Hebrew, which I think the most probable, esteems it 1656 years; the Samaritan reduces this period to 1307 years, a term which appears evidently too short. It shortens the lives of the 6th, 8th, and 9th descendants from Adam nearly 100 years each; and though the age of Methuselah has always been proverbial, it gives him near 200 years less than many of his predecessors. As to the Septuagint version, it allows exactly 600 years more to it than is given by the Hebrew. These are precisely the years of Noah at the deluge. I suspect that these interpreters having found some copy wherein, by mistake, the 600 years of that patriarch were added to the sum-total of the lives of his predecessors, had adopted it; and, in order to find the whole amount in the sum of all the generations before the flood, added 100 years to the age of the five first and of the seventh generation at the birth of their respective sons. They have in like manner added the same precise number of 600 years, the age of Noah, to the time elapsed between the deluge and Abraham, beyond what I shall hereafter shew ought to be the real calculation of Genesis. By these additions to the age of the world, they approached nearer to the Grecian and Egyptian chronologies. That such double entries are far from impossible, we shall presently see by the example of an author whose profession it was to be exact in numbers.

(s) Page 23.

The Chaldeans, according to Berofus, reckoned 120 sari of years from Alorus to Xixuthrus, comprehending the reigns of ten kings to the flood. These sari Mr. Bailly thinks proper to take for lunar cycles of something more than 18 years and a half each: but they were certainly decades of years; and Africanus proves it by more nicely calculating this period at 110 sari and 99 years; the 6th king, Daonus, being said to have reigned only 99 years, or one less than 10 sari; Apollodorus and Abydenus giving him in rounder numbers 10 sari.

(t) Page

(i) Page 24.

To make out this date, Mr. Bailly adds 46 years to the 30 years reign attributed by Ferduffi to this Caiamurath. Some antient Persian chronicles pretend he lived 1000 years, and reigned 560. The learned author reduces these into lunar revolutions, and consequently into 76 years. It may be asked, why these same lunar years might not be extended perhaps to some further period of this chronology beyond his reign? The Persians make him an antediluvian monarch, the son of Adam and brother of Seth; and in that case he may be nearly entitled to the whole 1000 years of life. But the Tartars, as we have before observed, call him the grandson of Japhet, contemporary with Turk. What real credit can be given to histories so confused, or to dates on which there is such disagreement? Facts and dates are every where in these remote ages adulterated and confounded; but the essential ground-work, that which belongs to the whole human race, is still to be discerned through the chaos of fictions invented, or of truths perverted, by the vanity of particular nations.

(u) Page 24.

Mr. Bailly has here very considerably lessened, on what grounds I know not, the total amount of years which must result from the several durations of Manetho's dynasties, as given us by any of his original transcribers. Let us remark, however, that according to the great Egyptian chronicle this whole space, from the reigns of the gods, should only consist of 2887 years, comprehending the 217 years of the reigns of eight demigods. But in this account who shall assure us that all these are solar years? They immediately succeed to years of days: and since that time, years of 28 days, of three, of four, and six months, and lunar years of 354 days were also in use in Egypt.

(w) Page 24.

Our author reduces these 11340 years from Menes to Sethon to 2815
years,

years, by taking them for years of Horus of three months. It is surely protracting the use of these short years very long, to bring them down so low as the 8th century before Christ. It must be observed, that out of the several years which at different times obtained in Egypt, he makes such an arbitrary selection as may best suit his purpose of accommodating all these chronologies, as nearly as possible, to his favourite Indian era.

(x) Page 24.

Mr. Bailly had estimated the length of the preceding age by years of days. Why give solar years to this interval, which belongs not more to the 4th than to the 3d age? If by these imaginary intervals between these ages, progressive from 800 to 200 years, any thing is really meant, this last might as well represent the time taken up between the commencement and the end of the deluge itself. Reckoned as days, these 400 years would nearly be the time Noah was shut up in the ark. Our author had already given these 400 years to the 3d, or antediluvian age: here he makes a double employ of them to increase the duration of the present. If I have suspected the seventy interpreters to have made a like double entry of the 600 antediluvian years of Noah, we here perceive how easy it is to make such mistakes when any favourite object is in view. Mr. Bailly judged these 400 years necessary to perfect his Indians in the study of astronomy.

(y) Page 24.

The genealogy of the kings of Dehly, descended from the race of the moon, presents an evidently exaggerated calculation. The reigns of 70 kings take up 3145 years, which would be reckoning them at more than 44 years each. By computing them at 30 years each, as Mr. Bailly generally does, this term will be reduced to 2100 years: but if reckoned, as reigns should be, at 21 years, this succession of kings will only give us 1470 years.

(z) Page 24.

The two lists of kings of Galeor and of Oude sprang from the family of the

the Sun, carrying us no higher than 278 years before Christ, are useless to Mr. Bailly. The genealogy of the kings of Cachemire begins by a blank space of 653 years, followed by the reigns of 50 kings; the length of whose reigns not being set down, our author, according to custom, chooses to value at 30 years a piece. The reigns of which an account is given take up only 1062 years, which, with the 653 blank years, and the 50 reigns estimated fairly at 21 years each, would, on the whole, give us 2765 years.

(aa) Page 24.

The authority on which Mr. Bailly gives this date to the commencement of the Chinese empire is unknown to me. The Chinese at this day compute time by cycles of 60 solar years each: The first of these carries us to the year 2697 before Christ. This date accidentally coincides with that which I have given to the deluge; but I have not sufficient confidence in Chinese chronology to lay any stress upon this conformity. It will however shew, that their most generally avowed computation of time does not extend beyond what may reasonably be warranted by scripture chronology. Notwithstanding this national date, which may naturally be supposed to correspond with the first establishment of the empire, which in fact is said to begin with the reign of Hoam-ti, this nation is not behind hand with the Egyptians in fabulous accounts. The popular story is, that Fohi and his 21 successors reigned 18000 years before Hoam-ti. But as neither the Chou-king nor any of their respectable annals take notice of this long period, Mr. Deguignes very justly remarks it to be unworthy of any attention. Their best authors place only eight monarchs before the reign of Yu, the founder of the dynasty of Hia. The three first of these are called the San-hoam, or the three august emperors, and the others, simply the five emperors. It is not agreed who were the three first, but some suppose Fohi, Chin-nong, and Hoam-ti; neither is it clear whether Yu is or is not comprehended in the five last. None however pretend to any settled chronology before the time of Yao, father of Chun, the immediate predecessor

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of Yu. According to the authors followed by Mr. Deguignes, this last emperor began his reign in 2207 before Christ, and Hoam-ti in 2707. But if from the commencement of the third dynasty, called Tche-ou, in 1122 before Christ, a period at which chronology may reasonably be supposed somewhat more correct, we adopt the computations of the T'fou-chou, or book of bamboo, the only chronicle said to have escaped the general destruction of Chinese annals under Chi'hoam-ti, the beginning of the reign of Hoam ti will be placed in 2651 before Christ. In times posterior to that monarch there are still great variations amongst their chronologers. The duration of the dynasty of Hia, by all their best historians invariably styled the first dynasty reigning in China, is by some called 432, and by others 471 years, whilst that of the succeeding dynasty of Cham is by some computed at 496, and by others at 645 years. In much later times, whilst the empire was for many centuries split into several kingdoms, the chiefs of which often assumed at the same time the title of emperors, there is great reason to believe that the chronological succession of those, who are now acknowledged as such, is lost, or at least very uncertain. From all this it appears, that the popular chronology of China is no less mixed with fable than that of Egypt, and that there reigns much uncertainty amongst their best historians as to dates in times when their annals begin to assume a more regular form. If their account of things preceding the dynasty of Hia has any foundation, it is probably no other than that of the general traditions of mankind. Hoam-ti, whose name signifies Lord of the Earth, possibly denotes Noah; and his predecessors, at the head of whom is Fohi, styled by them the first of men, must be the antediluvian patriarchs. It is worthy of remark, that the most antient dates to which the Chinese authors affix any degree of authenticity, as well as the commencement of their first cycle, are not anterior to the very probable era of the deluge. From a review of their history it is evident that we are to abate much of our high ideas of the Chinese empire, not only in its early beginnings, but for many ages after the first population of the country. The first settlers were possessed of a very small portion of its present extent in the north-western province of Chen-si. During

ing the whole of the first dynasty of Hia, comprehending between 400 and 500 years, the inhabitants were extending themselves slowly into four only of its northern provinces, some of which they were employed in draining from the waters. Of their very first possessions in the provinces of Chen-si, Chan-si, and Pe-tche-li, no inconsiderable districts were at that period held by their inimical Tartar neighbours. There, as in every other part of the world on its first occupation, the chiefs of those colonies, who progressively settled themselves at some distance from their first habitations, set up for themselves, and either owned a slight homage to the original chief and his descendants, or became entirely independent. Hence, during their second dynasty of Cham we see many petty, at first tributary, and at last independent, kingdoms arise. Under the dynasty of Tche-ou, which began in the year 1122 before Christ, the whole Chinese dominions comprised only the five provinces of Chen-si, Chan-si, Pe-tche-li, Chan-tong, and Ho-nan, parts of all which were still possessed by the Tartars. Comparatively inconsiderable as this empire then really was, it was divided, in the reign of Ven-vam, who began this dynasty, into many petty sovereignties, the number of which was successively increased to fifty-five. These were not reunited under one dominion until the reign of Chi-hoam-ti, in the year 247 before Christ. The great wall of China has been alleged as a proof both of the great antiquity and of the early power of the Chinese empire: but Mr. De-guignes remarks, that a very great part of that now astonishingly extensive work was raised in a succession of ages by several independent princes, on the frontiers of their separate territories, as a barrier against their troublesome Tartar neighbours; and was only strengthened and connected by new additions, and particularly by similar fortifications on the borders of his former kingdom of Tsin, by Chi-hoam-ti, when he became master of the whole empire at a period very far from claiming high antiquity. To pursue this abstract of Chinese history—the empire was again divided in the year 207 before Christ into six kingdoms, and shortly after reunited under the Hans. In the year 220 after Christ it was again split into three distinct kingdoms, over which the Tsin obtained pre-eminence for a very few years. In 420 a

race of Tartar princes seized on the north-western parts, whilst the dynasty of Sum, of Chinese origin, reigned at Nanking over the eastern and southern provinces. By these southern provinces we are not however to understand the whole of what is now called Southern China, which history informs us was yet in a savage state under barbarian chiefs in 586. It was not probably till 1162, when the Niu-tche Tartars possessed themselves of all northern China, and the Chinese dynasty of Sum took refuge in southern China, then distinguished by the name of Ma-tchin, that this last was reclaimed from barbarism by their presence. In 1303 both the Tartars and the Sums were conquered by Kublai-Khan, and he and his successors were the first monarchs who reigned over all China. After a dominion of 93 years, the Moguls were expelled by a new Chinese dynasty called Mim. These were again subdued in 1644 by the Niu-tche, now denominated Man-tcheou Tartars, who are still in possession of that empire reunited to their native country, and great part of western Tartary.

Such is the concise abstract of Chinese history gathered from their best annals by Mr. Deguignes, in which we see that the first population of that country, the progress of which was no less slow than that of other parts of the world, dates not beyond the probable era of the deluge, and that that nation was in a state of infancy and mediocrity much later than several others of the western world. In this several great and opulent empires had succeeded each other, whilst 300 years before Christ the most flourishing part of China was divided into petty kingdoms, and the southern parts of it were not emerged from the savage state many centuries after that period. With respect to the Indians, that other still existing antient people of Asia, whose chronology has been of late still more strenuously opposed to that of Scripture, it has been already observed in a former note, that, according to Mr. Sönnnerat, they, in 1783, reckoned 4884 years from the commencement of their fourth or present age, which followed a general deluge, which consequently dates 3101 years before Christ; but Sir William Jones, whose labours have lately thrown so much light on the antiquities of that nation,
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is persuaded; from the confrontation of their oldest records, that the commencement of that age really dates no higher than 2000 years before the Christian era. This would prove a very gross mistake in their computation: but I should rather imagine that their antient astronomical chronologers, instructed by tradition that the date of the deluge was not far removed, fixed the precise date, according to their ideas of judicial astronomy, to a year not very far distant from the real epoch, in which they found by their retrograde calculation an extraordinary conjunction of the sun, moon, and planets; in the same manner as they have evidently determined the commencement of their preceding third age, in which they say man was first created. Thus the undoubted general tradition of the destruction of this earth by a deluge, the creation of mankind in a prior-age, preceded by that of the earth and of the angels, has been by them determined not by historical epochs but by fictitious astronomical periods.

(bb) Page 27.

The antient chronology of Egypt is a labyrinth from which it is impossible for us at this day to extricate ourselves. The tables of Manetho, over and above their original faults, have been transmitted to us by their transcribers Africanus, Eusebius, and Josephus with very great variations. Sir John Marsham, Sir Isaac Newton, and father Pezron have, with great probability, conjectured that the 15 first dynasties are chiefly composed of monarchs not reigning successively over all Egypt, but of petty kings reigning contemporarily at This, Elephantis, Hieracleopolis, Diospolis, Memphis or Xoïs, towns from which these dynasties receive their names. Sir Isaac Newton notices another source from whence the list of kings has probably been augmented, the repetition of the same, or nearly the same names appearing more than once in the same order. Besides those pointed out by him, I will also observe that in the 18th dynasty, which relates to the time above spoken of, several such repetitions occur. In the lists of Africanus and Eusebius, Amosis is also called Thethmosis, and after the 6th from him, Mispfragmuthosis, a king called Thutmosis reigns; Archencherres, Chencherres,

Chencherres, Acherres, Cherres, look much like the same name differently written, and denote probably the same man. In Josephus, Halisphragmuthosis is succeeded by Tethmosis; and, after four intervening kings, Misphragmuthosis is again succeeded by a Thmosis or Tethmosis. There are also several opinions both as to who the first and second shepherds were, and as to the time of their final expulsion. The learned Mr. Bryant, intent on his favourite system of making the lawless and daring sons of Chus, who, from their first invasion on the property of Shem under Nimrod and Chanaan, are not improbably, as he contends, denoted by the giants and Titans of antiquity, the conquerors of half the earth, asserts, that the first shepherds were Chusites, and the second the Israelites inhabiting but not reigning over Egypt. He maintains the Osarsiph of Manetho to be Joseph; that Sethos *Ægyptus* was that king of another race who knew not Joseph; and that it was in his grandson's time, the third Amenophis, that the Israelites deserted Egypt. In answer to this it must be observed, that the Pharaohs of Abraham and Moses seem to have reigned over all Egypt, and that the division of the kingdom appears to have taken place after the days of the latter, as in the times of the judges of Israel, and even during the reigns of its first kings, mention is always made in Scripture of the kings of Egypt in the plural number. Sir Isaac Newton observes, that the Pharaohs who reigned in the times of Joseph and of Moses were not shepherds, but Egyptians observing all the Egyptian rites. Osarsiph is by Manetho himself said to be the same as Moses. *Ægyptus* the brother of Danans is, as we shall hereafter shew, of too recent a date to be contemporary with Joseph. Sir Isaac Newton thinks, as appears to me, with much greater probability, that the shepherds expelled by Misphragmuthosis and his successors were the Amalekites and others fleeing from Joshua, who had seized on that vacant part of Egypt quitted by the Israelites, at a time when the Egyptians were not only weakened by that desertion, but by the loss of their army and of their king. The disorders thence following might probably occasion at the same time the erection of several kingdoms in the remaining part of Egypt. The oriental historians tell us that Masar and his son Coptim.

Coptim were the two first kings of Egypt after the flood. Khondemir and all of them agree, that the Amalekites were the shepherds who invaded and conquered Egypt, though they differ as to the time. Some place this invasion as high as the time of Coptaim, third king of Egypt, and others as low or lower than the days of Abraham; either of which would well coincide with Mr. Bryant. But the impossibility is self-evident, as Amalek, the founder of the Amalekites, was great grandson to Abraham; and the nation sprung from him, seated near Chanaan in the days of Moses, could not be considerable enough to make conquests much before his time; but defeated by him and Joshua, it is very probable that they might have sought refuge in the deserted land of Goshen, and gradually possess themselves of great part of Egypt, from whence they were expelled three centuries after. With the oriental as well as western writers there are great chasms in the history of Egypt, which necessarily confound all chronology. For want of Egyptian dates, the corresponding events of that country have been accommodated both by antients and moderns to the Grecian chronology, which, from the siege of Troy upwards, Sir Isaac Newton has fully proved to be erroneous, and antedated by more than two centuries, and in some instances much more.

(cc) Page 27.

These so exactly coinciding numbers of kings and priests, whose images the Egyptians shewed to Herodotus, justly appeared to him suspicious. The city of Memphis itself, where these pretended monuments were preserved, was either not built or of little note in the time of Homer. Herodotus tells us, that their priests assured him that the gods had never visibly dwelt upon the earth, though at other times they pretended that the sun and other gods had governed Egypt during so many ages. We thence perceive how many contradictory tales these priests, anxious to maintain the veneration and superstition of their votaries, were capable of inventing and accommodating to the capacity of their hearers. In this same passage this historian gives it as his opinion, that the Greeks had borrowed from the Egyptians the names of the twelve great gods, which they had

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had afterwards applied to mere mortals, whose origin was very far from antient.

(dd) Page 27.

On the above motives the first Jesuit missionaries exaggerated beyond measure whatever related to China. Its antiquity, government, manners, sciences, arts, and population, were held up to the admiration of the world. For other reasons modern philosophers have wished to perpetuate the prevention. The fabulous tales of their antient chronicles, rejected by their own learned men, have been treated as deserving more respect and credit than those of other countries. Their government has been assimilated to the administration of a tender and beneficent father, whilst in fact it is no other than the despotism of one without control over slaves inured from infancy to submission. Like other slaves, the Chinese have had their Neros and Heliogabaluses. Abbé Raynal is transported with the idea, that in China there is no other distinction than that which follows state employments, which he is willing to confound in that country with real merit. But this in an arbitrary monarchy is well known to be the strongest proof of complete slavery. We are told with enthusiasm, if the people murmur in any province, the mandarin is certainly punished, because he has displeased the children of the common father. In Turkey, we see visirs and pachas strangled to appease the fury of the soldiery or of the mob. Why should we suppose paternal care the sole motive there, whilst we know that nearer to us it is the effect of that terror which every where environs the throne of despotism? It is repeated with affected admiration, that their conquerors have ever submitted to the laws of the vanquished; but those invaders have always been half savages; and, as Mr. Raynal himself observes, what conqueror ever rejected laws which give him absolute power? Destitute of courage or energy, the Chinese, notwithstanding the superiority which their numbers should give them, have ever been the easy prey of those little hords of Tartars who hover on their borders. Forty thousand men effected the last conquest of that immense country. If
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any thing can shield them from the like in future, it would be the policy of the present Tartar race who rule them. They people their antient country with Chinese; but in a few ages these will become real Tartars, and those will be debased into Chinese. One may safely predict it from analogy, since such has been the constant revolution of their history. Never had the thirst of gold more power upon the most corrupt nation than upon the Chinese; they never possessed more than the outlines of the fine arts or of science; their patience alone triumphs in some mechanical arts. Invention and improvement are unknown and uncoveted by them. Father du Halde gives a million of inhabitants to the city of Canton, and Father le Comte increases them to 1,500,000. Mr. Sonnerat however asserts, that with the help of several Chinese he verified the population of the Chinese and Tartar towns, and of that of boats, and that he could not find them all to contain more than 75,000. He pretends, that if Pekin is built on the same model, it would require 50 leagues in circumference, instead of six, to contain the two millions of inhabitants which are allotted to it. He has probably undervalued its population; for Captain King reckons that of the Chinese and Tartar towns at 150,000, and supposes that the sampans or boats may contain 200,000 more. But there is yet a wide distance between 350,000 and a million or a million and a half, given to it above 100 years ago, notwithstanding the probable great increase of population in those parts from the greatly increased trade with Europe. The laborious industry and the sobriety of the people greatly favour population; but the difficulty of subsisting causes an incredible number of children to be annually and openly thrown into the rivers, without drawing either the attention or opposition of government, whilst avarice and luxury are unbridled, and with those in office surpass perhaps the excesses of any other country.

(ff) Page 29.

In the time of Confucius, 550 years before Christ, northern China was divided into several petty kingdoms, acknowledging a degree of supremacy in a chief monarch. This philosopher was a subject of the king of Lou.

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By his talents and virtues he rose to be prime minister of that state, which the disorders of a new reign forced him to abandon. He then visited the several little courts of China in hopes of gaining proselytes to his maxims and doctrines, and was favourably received by the reigning chief monarch of the dynasty of Song. China, like many other countries in the first ages, was then governed by several chiefs or kings, who yielded a kind of homage to the most antient or the most powerful royal family. It is thus we find Chordolahamer paramount of several kings. Sometimes also in extraordinary cases allied kings elected from amongst themselves a supreme chief. In this manner the Greeks chose Agamemnon to command all their princes at the siege of Troy under the pompous title of King of Kings—a title affected long after by the kings of Persia. This constitution is to be remarked amongst all infant nations, or those where antient simplicity still prevails. In Tartary there is always a grand khan whom the other khans acknowledge as chief, particularly in any great expedition. The emperors of China and of Turkey assume that title at this day in order to preserve a sway over eastern or western Tartary. In Ireland the petty sovereigns of its several kingdoms owned homage to a chief king. Very lately in the Highlands of Scotland the individuals of each clan looked upon themselves as vassals and children of the chief and common father of the family, whose name they all bore. If they thought some submission was owing to the kings of Scotland, it was as to the supreme head of all these chieftains. The Arabs and Tartars are still divided into distinct tribes or families having each their separate chief. In Tartary, as in the Highlands, these tribes, when remitted in an army, preserve certain ranks and pre-eminences, not at all regulated by the numbers or power of the hord or clan, and have a fixed order of battle regulated from high antiquity. In Tartary the hord of Niron succeeded to the pre-eminence of that of Cayat extinguished: and it was in virtue of that succession that ~~Gengis~~ Khan, as their chief, claimed the title of Grand Khan. These prerogatives certainly are derived from some antient order of primogeniture acknowledged amongst the branches of the same primitive family. It is the remnant of patriarchal

Jenghis

government, in which all the younger branches yielded a certain deference to the eldest. It has ever obtained amongst all those unmixed nations who have preserved some relics of their antient customs; it is probably the origin of feudal lords and tenures introduced into Europe by the barbarous nations of the north. In their own countries the preeminence was personal; by their conquests it came to be confounded with and finally annexed to territorial possessions.

(gg) Page 29.

In the learned dissertations relating to the history and antiquities of Asia, we find the words of Confucius literally translated from the Sanscrit:—*viz.* “Although, like other men, I could relate, as mere lessons of morality, the histories of the first and second imperial houses; yet, for want of evidence, I can give no certain account of them.” It is to be observed, that the third dynasty commenced only about 1100 years before the Christian epoch; and it is asserted that even of that third dynasty no unsuspected memorial now remains. In fact, the destruction of all historical records in the third century before Christ must cast a doubt upon all events said to have happened any length of time before that period.

(bb) Page 32.

The Persian historians give Japhet 11 sons: 1. Gin, Tchín, or Sin; 2. Secláb; 3. Manshui, called by Mr. Deguignes, Manschouge; 4. Gomari, or Camari; 5. Turk; 6. Khalai; 7. Khozar; 8. Rus, or Roufs; 9. Sufian, or Soussan; 10. Ghaz; 11. Taraj, or, according to Mr. Deguignes, Tarage. Vide Herbelot. The Tartarian authors name only eight sons: 1. Turk; 2. Khars or Chars; 3. Saklab; 4. Rufs; 5. Maninach; 6. Zwin; 7. Kamori; 8. Tarikh, or, according to the above author, Taridge. Vide Abulghazi-Khan. Amongst these it is easy to distinguish, in both lists, such as are so neatly similar as to be evidently the same as the sons of that patriarch named in Scripture, as Turk or Turgoma, from whom the Turcomans; Gin or Gog; Gomari or Gomer; Rufs or Rofs. Taraj, or Tarikh, appears to me the same as Thiras. Maninach in one list Mr. De-

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guignes takes to be the same as Magiougé in the other, and to be the father of the Mameluks; but as Magiougé in the Persian list is also called Manshui, it seems to me that he is most probably the ancestor of the Man-tcheou Tartars. He supposes Suffan, Ghaz, and Taraj to be the fathers of the Turcomans, but the last of these I think represents, as before said, Thiras, the father of the Thracians. Saklab in both lists he imagines to be the father of the Sclavonians. Khozar seems to be the same as Khars, from whom the Georgians and neighbouring nations of Khorasan are probably descended. From Khalaj it is not unlikely that the Kalmoucks may be derived.

(ii) Page 35.

The building of Sicyon in particular seems beyond measure antedated by the Greek historians. If one people had already united in Greece in social life, it is not natural that contiguous parts and all the rest of the whole country should remain unsettled, and wait the arrival of strangers centuries after to follow the example. To fill up the space, twelve kings after Ægialeus have been interpolated, of whom nothing is recorded; but Sir Isaac Newton clearly proves from other concurrent parts of Grecian history, that Ægialeus founder of Sicyon, and Phoroneus who built Argos in its neighbourhood, were brothers, both of them sons of Inachus, called the son of Oceanus, probably because he came to Greece by sea. That learned man also shews, that there were only eight kings of Sicyon before Agamemnon, in whom, after the ruin of that town, were reunited the territories of Sicyon and Argos. These reigns he reckons at 20 years apiece, and thus places the foundation of both only 160 years before the reign of Agamemnon. Though this may be a medium of the several computations he has produced, I must observe that there is in general a wide difference to be made between a long succession of kings, in which are united all the various incidents which can attend human life, and a short series wherein one single long reign may greatly raise the general rate. In this view I have examined the reigns of the last eight kings of Europe. From Russia, Sweden, and England we cannot draw any fair inference, because, during this period, the usual order of succession has been repeatedly interrupted, and

and princes of an advanced age have succeeded to the throne. But the successions of France, Spain, and Denmark will be a fair criterion. In France indeed the two last reigns are of a length perhaps unparalleled in history as immediately succeeding each other; but in Spain and Denmark there has been no reign of immoderate length, and yet in both these countries the duration of the last eight reigns exceeds that of the kings of France. Taking them all together, these 24 kings will have reigned more than 33 years apiece: and I must notice, that had the Stuart line continued in England, their reigns would have given us above 31 years on an average, though Charles the first came to an untimely end, and two brothers succeeded each other. I thence infer, that it will be in no wise contradictory to the frequent course of nature to allow the eight kings of Argos and Sicyon 30 years reign each, which, with 25 years which Agamemnon had reigned when Troy was taken, will place the foundation of these cities 265 years before that event.

(kk) Page 35.

Hesiod says, that the flood of Deucalion and the arrival of Cadmus into Greece happened only four generations, or at most 140 years, before the siege of Troy. The chronologers, in spite of this authority, place it 319 years before.

(ll) Page 35.

The expedition of the Argonauts to Colchis has also been much antedated by the Greeks. Sir Isaac Newton justly observes, that Eratosthenes and the first Greek chronologers, finding no certain dates for the antique events of their country, formed to themselves a technical chronology by computing the successions of the kings and of the priestesses of Argos, in which they erroneously took these successions for ages or generations, and reckoned 100 years, and sometimes 120, to three generations, instead of allowing, as Sir Isaac contends, 18 or 20, or, as I apprehend, in a long series almost 22, years for each reign or succession. Æsculapius and Hercules

cules were Argonauts, and Hippocrates was the 18th, by the father's side, from Æsculapius, and the 19th from Hercules, by the mother's side; which Sir Isaac computes, by reckoning only 28 years to a generation, as these were mostly by eldest sons, at 504 years, and fixes the event at 506 years before Hippocrates wrote, *anno* 431 before Christ. But as I think we may even in this kind of generation by eldest sons allow two years more to each; I should be inclined to settle it towards 971 years before the Christian era. According to Meton, who made his observations in the 316th year of Nabonassar, also answering to 431 years before Christ, the solstices and equinoxes had retrograded seven degrees from the time of Chiron, who, just before the Argonautic expedition, had fixed them in the 15th degree of Cancer, Chelæ, Capricorn, and Aries; which, at the rate of 72 years for a degree, makes 504 years. But as both Chiron and Meton may probably have failed in minute exactness of observation, and, disregarding minutes and seconds, have fixed these points of the heavens in round numbers of degrees, we may reasonably allow half a degree more, which Sir Isaac has not done, and so fix the time of the Argonautic expedition, as before, towards the year 971 before Christ. The great Hipparchus, comparing his own observations with those of former astronomers, concluded, first of any man, that the equinoxes had a motion backwards with respect to the fixed stars. By his observations, made somewhere between the 586th and 618th year of Nabonassar, it appears that they retrograded about eleven degrees since the days of Chiron. Prejudiced in favour of the chronology established in his time, that philosopher concluded, that the equinoxes went backwards one degree in 99 years, whereas their real retrogradation is one degree in 72 years. This is a further and unanswerable proof, that the Grecian chronologers had antedated the Argonautic expedition somewhere between 250 and 300 years, which, from want of minuteness in the astronomical observations, cannot be fixed with precision, but on a medium will nearly coincide with the time above mentioned. Consequently the siege of Troy, the great era of ancient Greece, and that from which many of the events of Egyptian history have also been fixed, which undoubtedly, as
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many of the Grecian captains engaged in it were sons of Argonauts, happened in the next ensuing generation, has been also antedated about the same number of years.

(mm) Page 36.

Having nearly fixed the date of the Argonautic expedition, we cannot be much at a loss with respect to that of the taking of Troy. Sir Isaac Newton places it in the 904th year before Christ, for the following additional reasons. From the return of the Heraclidæ to the 6th year of Xerxes in 479, seventeen kings of both races had reigned at Sparta. These reigns he computes at 20 years a-piece, to which adding two years for the duration of the war and reign of Aristodemus, the sum will be 342; and Thucydides asserts, that the Trojan war did not precede that return more than 75 or 80 years. As I think it right to allow 22 years to each reign, to which I am sufficiently authorised by the retrospection of the average reigns of the last seventeen kings in the above-mentioned states of Europe, I am inclined to suppose that Troy was taken in about the 935th year before Christ. There will still be a difference of about 250 years between this and the Grecian chronology. That nearly such a difference exists between the real and commonly supposed dates of events in ancient Greece, and in several much more, Sir Isaac Newton has adduced such various and corroborating proofs, from every part of its history, as makes it a matter of astonishment that succeeding chronologers should still continue in the old beaten track.

(nn) Page 37.

Hesiod informs us, that he wrote in the age next after the wars of Thebes and Troy, and that that age would finish when men grew grey and dropped into the grave; and therefore we cannot place much more than the length of one whole generation between the last war and the time wherein he writes, which will bring us to the year 900. Homer, though younger, was his contemporary. Herodotus, born in 480, asserts that He-
siod:

herds, which Homer has animated by representing the sudden inroad of lions, who, having watched the morning egress from the fold, had already seized a bull, and, undismayed by the clamours of the herdsmen and their dogs, tear it to pieces. The second is a calm and cheerful landscape, where we see in perspective a pleasing valley interspersed with cots and covered with sheep. The last compartment, the labours and duties of the year completed, gives a view of the rural amusements and games of labourers, shepherds, and citizens. Women and men dressed in their best attire form together the dance of Gnosus, or of Ariadne, which, by its quick and mazy movements in complicated circles, represents the labyrinth of Crete. In the midst are tumblers, who by their tricks of agility add to the amusement of the spectators. It is thus that in the circle of this fourth plate each compartment forms a complete and distinct picture, in which the subject is one, but the reunion of all, connected and contrasted in the most pleasing variety, forms one great design—representative of the whole tissue of human life. The ocean, in the fifth plate, raised in silver waves, rolls round the whole, and forms the outmost border. In this admirable piece of work, as represented by this prince of poets, we cannot sufficiently admire the whole and every part of the design. Composition, disposition, and expression, all are worthy of the greatest artist. From one picture to another the mind is agreeably relieved by variety, and by a succession of emotions. In each separate piece the unities of time, of action and of scene, are strictly observed; very unlike the discordant works of many subsequent, but yet sufficiently esteemed painters. In each group, without confusion, the attitudes of every figure are finely varied, and strongly expressive. The art of lessening objects in perspective was either known in his time, or the premature genius of the poet had conceived it. In the sixth tablet the prominent figure of Destiny stalking through the field of carnage, already seized of the dead and of the wounded, and impelling the yet unhurt into the thick of danger, is a sublime idea, worthy, as Mr. Pope justly observes, of the allegorical genius of a Rubens. Were a great painter, sufficiently eminent in every part of the art which the whole would

would require, to undertake it; by closely following Homer, from whose short but animated description his genius might be roused to the highest exertions, he might surely form the most interesting gallery of pictures ever yet exhibited. It is to be hoped some daring genius will one day attempt it. The subject is not some antiquated and frequently little known story, it is the animated and ever interesting history of every age and country. Let us notice, that in the second picture the subject is a pleading before the people, in which the dispute is between two men, one of whom pretends to have paid the compensation for murder, and the other denies the receipt. This teaches us the custom then existing of fining for murder: perhaps too Homer meant to insinuate, that the man who is capable of assassinating is little to be trusted in any thing. In the third picture he informs us, that the herald placed a sceptre in the hands of each of the judges when about to deliver his sentence, and that a public recompense was allotted to the senator who was esteemed to give the best judgment. The cause appears to be the same, removed to the senate of elders on appeal from or on the indecision of the popular assembly. In the fourth and subsequent pictures this great poet, ever moral, and ever the most faithful painter of those passions which mislead mankind, represents the besiegers disputing amongst themselves on the disposition of the booty already grasped in imagination, whilst the besieged profit of their contentions to lay an ambushade and thus deceive their ill-founded and mistaken hopes. In the seventh and eighth tablets, kings are represented encouraging the ploughmen and the reapers. In those yet simple ages, sovereigns watched themselves over rural labours, sole sources of their power and riches.

(ss) Page 45.

The antient island of Pharos, which in the time of the Greeks and Romans covered the road of Alexandria, is at present joined to the continent by a neck of land, formed by the accumulation of sands. By the negligence of the Turks the harbour itself is daily filling up. In the days of Homer, that former island was at a considerable distance from the main land,

as this poet clearly asserts in the fourth book of the *Odyssey*. He assures us that it was at the distance of a day's navigation with favourable winds from the Egyptian shores, and he calls that distance a great and stormy sea. I am aware that Mr. Volney, author of a voyage into Egypt and Syria, combats the opinion of Mr. Savary, who had lately remarked those expressions of Homer as a proof of the extension and gradual elevation of the Delta since that poet's age. He pretends, that the latter is wrong in bringing Homer to support the opinion he had adopted: and as a proof of it, he cites the translation of Madam Dacier, which gives a different sense to this passage. But if Mr. Volney had taken the pains of consulting Homer either in the original or in some faithful translation, he would have seen that Mr. Savary truly cites the express and nonequivocal words of Homer. Madam Dacier's enthusiasm for that great poet is well known. Not to expose him to criticism at a time when the dispute concerning the antients and moderns was very warm, she sometimes took the liberty of correcting him in her translation. On this occasion, not having herself a suspicion of so great a change in the Delta, she thought right, in order to cover, as she imagined, the poet's ignorance, to give a different and more probable turn to this passage. But the text of Homer clearly imports an extent of sea, and not of river, which may be reckoned about 12 leagues between the isle of Pharos and the opposite shores of Egypt. The navigation of those parts was sufficiently known to the Greeks in his time, and the poet himself had made the voyage, and spoke from his own full knowledge of the then situation of that country. According to him then the whole of the Delta did not yet exist. Other antient testimonies attest too, that this fertile part of Egypt owes its existence to the gradual deposits of the Nile, which, in former times, took its course to the west above Memphis and the Pyramids, and lost itself in the sands of Libya. The industry of the Egyptians diverted, says Herodotus, in the time of Menes the course of the river, great part at least of which ran on the further side of mount Ptarmus, 100 stadia to the south of Memphis; and he asserts, that this change of channel contributed to raise by degrees the land of Delta and add it to the valley of Egypt.

Egypt. The sea, according to the tradition of the antients, say Herodotus; Strabo, and Diodorus of Sicily, once washed the foot of the hills on which the pyramids are built. Aristotle also tells us, that excepting the district of Thebes, the most elevated part of the valley, all the rest of Egypt both above and below that town was in the earliest times covered with waters, and was in process of time only raised by the deposits of the Nile, and drained by the industry of its inhabitants. This opinion is confirmed by the signification of the ancient name of the Thebais (afterwards communicated to the whole country, and even to the river), which described it as an island, the island of Caphtor or of Coptos. If later authors referred these changes to higher antiquity, it was because the Egyptians gave false dates to the towns built on the Delta. But Homer could not speak either of lands or towns which existed not in his time. Here then is a constant series of traditions, which shews us the first origin of the filling up of a bay or arm of the sea, formerly existing in those parts, and the successive progress of the extension of land to our days. In early times, by reason of some bar or ledge of sand in the course of the river, all lower and even great part of the higher Egypt, the district of Thebes excepted, were overflowed and marshy, and the middle part of the Delta was yet full sea. The bar removed, the whole valley was relieved from stagnant waters, and the inundations of the Nile depositing its slime gradually raised it. As yet the accumulating and often shifting sands of Libya afforded it a slow passage to the sea, and often obstructing it forced its waters backwards, and rendered vain the progress of draining. The Egyptians wisely at length determined to change the channel, and to turn it into a much shorter course through their own territories into the nearest sea. The mounds which effected this were still guarded with anxious care by the Persians in the time of Herodotus. That part of Libya deprived of its river became totally barren, and the Nile, through its new channel flowing more easily, gradually filled up by its slime the shallow bay, and thus in time raised the Delta. In the time of Homer the prolongation of the land was yet inconsiderable; and we see by his description that it consisted of uncultivated sands frequented by sea-calves and fishermen.

men. In after times the increasing numbers of the inhabitants of the valley eagerly seized on these sands, and their industry hastened the conquest which the Nile had begun. Soon the bay disappeared, to make place for a land more fertile than any of the antient domains of Egypt. The lake of Moeris was dug to a vast depth, as a reservoir of water and fertility in case of need. Herodotus informs us, that the vast quantity of earth dug from thence was thrown into the Nile. This earth, with that taken from several cuts and branches through which the river empties itself into the sea, two of which are avowedly the works of industry, and from numerous other canals which intersect the country in all directions, would not a little help to raise both the general face of the country and the bed of the river itself. The Greeks, and Romans after them, took special care to keep these channels open; but the Mahometans having more and more neglected them, the port and road of Alexandria have been greatly filled up, and sands collecting have at length joined the isle of Pharos to the continent. Should that neglect be continued, they will in some centuries more add a new but desert and inaccessible coast to Egypt. Such is the constant progress of unassisted nature, wherever great rivers, subject to periodical inundations, carry considerable annual deposits. It is thus that the Ganges and Barakpooter have formed, and daily form, so many islands at their united mouths, and leave not a single port to shelter ships of burden. Should the number of their wandering channels be reduced, and the remaining ones kept open, these now marshy and uninhabitable islands would become the most fertile parts of Bengal, and afford commodious harbours. Such a work would be worthy of its present enlightened masters, and extend and secure their dominion much better than conquest. Even rivers which have only accidental rises form new lands at their mouths, which in time become considerable; such as those the Rhone has produced since the time of Lewis the ninth. It is thus that the Rhine has filled up and consolidated the antient lakes and marshes of Batavia, and, were it not for the assiduous care of the Dutch, would soon fill up the Zuidersee, which, notwithstanding all their industry and the diversion of the greatest part of its waters into the Waal

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and Meuse, is growing daily shallower; and, should any of these precautions be neglected, would be soon filled up, and the coast of North Holland rendered unnavigable, and in time perhaps joined to Doggers bank. Such have been, and would farther be if not prevented, the effects of the maigre and accidental floods of the Rhine, which bear no proportion with the annual muddy inundations of the Nile. Such are the constant operations of unassisted nature, which may be greatly accelerated, or formed to human purposes, by judicious industry; and they render not only possible but probable the former existence of an arm of the sea or bay in the spot now occupied by the Delta, so clearly announced by Homer and confirmed by old traditions. Mr. Volney, and since, Mr. Bruce, have strongly combated the opinion of Herodotus and Mr. Savary, who adduce, as proofs of the new existence of the Delta, some antient accounts which seem to state, that in days of yore a much less quantity of water sufficed to fecundate Egypt than was necessary in his days or at present. I will readily agree with them, that these various accounts were most probably owing to different measures made use of in those times in the Nilometer. But though the same identical quantity and measure of water may be now as sufficient to inundate as in the most early days; it is on the other hand no proof that the Delta and the whole valley of Egypt have not gradually risen. Along with the surrounding lands which have annually received some increase from the slime of that great river, the bed itself of the river has also been proportionably raised; and its waters will consequently equally overflow the adjacent countries, and, if human industry was added, extend its fecundating powers to parts formerly inaccessible to its highest inundations. Of this I will produce, amongst many, one convincing example.—The Loire receiving the waters of the Allier, which descend from the high and mountainous countries of Givaudan and Auvergne, has, when arrived into the plain country, considerably raised its bed within some centuries by the deposits which are brought down with its waters in every flood. These are torn from the mountains and rocks towards the source of the Allier, where its course is boisterous and rapid; and I have seen all its sands, at Tours, after a flood, covered.

covered with mica not to be found nearer than Auvergne. The mounds which were thrown up in Lewis the eleventh's time to confine its course, and preserve the adjacent plains, have, since that time, been often raised, and are constantly required to be heightened. Much raised within this century, they are still at times insufficient. To shew that these works have been necessary, proofs are at hand. The present church of St. Martin, the oldest fabric at Tours, was built in the eighth or ninth century: in 1788 the descent into it was by ten steps, and yet the then pavement was not its antient level. The police having prudently required, that if its canons were continued to be buried in the church, they should build vaults at a very considerable depth; they determined to effect this partly by excavation and partly by raising the pavement of the church to the level of the present entrances; a measure which the height of the church rendered very practicable. In digging they found two former pavements, the lowest of which was at least eight feet below the present, and is certainly as low, if not lower, than the actual bed of the Loire. In it were found several tombstones, and amongst others, one with an inscription importing, that under it was buried a former canon, brother to one of the antient dukes of Brittany. Another church of Benedictines nearer the river is so much below it, that were it not for the present mounds it would be constantly under water. These antient edifices, which could not have been there built had they at that time been so exposed, evidently prove, that not only the level of the town has been much raised, but that the bed of the river has been also since those times proportionably elevated by annual deposits from the mountainous countries from which great part of its waters are derived. Such in fact is the constant progress of nature; mountains are imperceptibly washed down and diminished; the plains are very slowly raised by their spoils; and new shores are extended into the sea. Partial accidents break not into the usual and general course of nature. Thus are those antient traditions, confirmed by the express description of Homer, importing that an arm of the sea extended into that part of Egypt which is now the Delta, rendered not only possible but highly probable, from the invariable course of nature in the

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the like cases. We need not go beyond our own island, to see new sands added to the shore, and gained by industry to agriculture. In Bristol channel, sands and islands are rising above the waters opposite to the mouth of the Severn. Had such a river as the Nile flowed into it, we may easily conceive that it would have been already in part filled up, and have formed fertile plains through which the courses of the rivers would have been prolonged, as has happened in Egypt.

(*tt*) Page 45.

Sir Isaac Newton thinks that this Proteus, whose name signifies President, was not king of Egypt during the Trojan war, but lieutenant of the sea-coasts to Amenophis Memnon, who, according to Pliny, was at that time the real sovereign of that country. Herodotus makes him king; but says, that this was not his Egyptian but his Greek name, which, if he was the sovereign, was probably Memnon, or Amenophis Memnon.

(*uu*) Page 45.

Mœris, by whose orders the lake of his name was dug, is by both Herodotus and Diodorus placed before Sesostris; but Sir Isaac Newton contends that he was the son of Rhampinitus. But whenever the lake was made, it appears that the seat of government, under whatever king, was not transported from Thebes to Memphis till after the time of Homer. If Memphis had been then considerable enough to have been the residence of kings, and the deposit of the archives, as the priests pretended in after times, that poet would surely not have passed it in silence. Though he talks of the wonders of Thebes, he speaks not of that city, which, according to his own description, could not have been far from the coast, and must have been the key of the kingdom. On the contrary, on that coast he represents nothing but inhospitable sands, the retreat of sea-calves and of fishermen. Memphis probably rose to eminence about the time of the building of the pyramids, the first of which was, according to Herodotus, built by Cheops, and from him we easily deduce nearly the time of its foundation. From

Cheops that historian reckons eleven kings to Amasis, both inclusive, who are successively named, as well as the length of the reigns of all, except two, Phreron and Asychis. The reigns of seven of these princes take up 208 years. To Cheops and Cephrenes, brothers, he attributes, in following the Egyptians, a duration beyond the course of nature, 106 years. But if on account of several long reigns we allow 30 years a-piece, one with another, to these eleven reigns, we shall have 330 years before the death of Amasis and the beginning of Cambyfes in 529; and thus the reign of Cheops and the building of the pyramids will be placed in about 859 before Christ. Diodorus, it is true, adds two more kings to this succession; but four of these immediately preceding the predecessor of Amasis are nameless: and therefore the account of Herodotus, born not more than 50 years after that king, is more to be credited.

(xx) Page 52.

This Egyptian chronicle seems to have been compiled about 90 years before Christ. To Vulcan, or fire, it ascribes an indefinite term, and it is his son Helios, or the sun, who first reigns over Egypt. To the first race of its kings it gives the name of Auritæ, or sons of light; to the second, of Mæstræi, sons of Mestr or Mesraim; and to the third, of Egyptians, or descendants of Caphtor. Mr. de Buffon, by attributing for an indefinite space the sole dominion of the earth to fire, seems to have revived this system.

(yy) Page 53.

Manetho attributes 9985 years to the reigns of the gods and demigods, of which 9000 are allotted to Hephestus or Vulcan. He is succeeded by his son Helios, or the sun; and the last of the seven gods is Typhon, whose name, signifying the sea or a deluge, possibly denotes, that in his time the whole world was drowned. Of the sixteen demigods Orus is the first, and Zeus or Jupiter Ammon, the last. After these follow Menes the first of mortal kings, and thirty dynasties who reigned over Egypt to the time
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of Alexander. The variations and discordances in these tables, as given us by Africanus and Eusebius, are so great, both with respect to the number of kings and duration of each dynasty, that it is impossible at present to ascertain the real text. By some the total duration of all these dynasties is made out to be 5300 years; by Syncellus it is reduced to 3555, and by Mr. Bailly to 3901.

(xx) Page 53.

Sir John Marsham supposes that Egypt, after the death of Menes, was divided into four distinct kingdoms—Thebes, This, Memphis, and lower Egypt—besides others of lesser note. He imagines Manetho's first 15 dynasties to consist of the monarchs of these several distinct states, reigning at one and the same time in that country. He contends, that Egypt continued so divided for almost seven centuries, till the pastor kings made themselves masters of all except Thebes. After their expulsion, all Egypt became subject to one prince. He thus reduces the duration of the whole empire, from Menes to the end of the reign of Amasis, to 1819 years. The learned Mr. Bryant thinks that the lawless and enterprising sons of Chus, who had already invaded much of the property of the sons of Shem, early also seized on the eastern parts of Egypt, and from thence subjected their brethren the descendants of Mesraim and Caphtor who had previously settled in that land; and that they fortified themselves in the district of Avaris or Aur, the same as Cush-aur and Cer-chush-aur, and the Cercosora of Mela and Herodotus. These he thinks to have been the first shepherds who reigned over the greatest part of Egypt, but who were finally expelled by Amosis, of the race of the antient proprietors of the land, descendants of Mesraim. His son Amenophis granted the province of Avaris to the sons of Jacob, who are, according to him, the second shepherds inhabiting, but not reigning over Egypt. This author, as has been already observed, thinks the Osarsiph of Manetho, called also Hermes and Trismegistus, to be Joseph the son of Jacob. Manetho however expressly says, that Osarsiph took the name of Moses after his retreat with the Phœnician shepherds from Egypt.

After the wonders he had wrought in that country, it is not surprising that the Egyptians should have given him the name of the second Hermes or Trismegistus. There seems no adequate reason to suppose him mistaken in this point. In pursuance of his idea, Mr. Bryant thinks that Sethos Ægyptus (or the Cophtite) was that king of another race, who knew not Joseph; and that it was in his grandson's time, the third Amenophis, that the Israelites left Egypt; and in this manner endeavours to account for the three races of kings mentioned in the Egyptian chronicle, the Auritæ, Mæstræi, and Egyptians. The first may probably mean Ham himself, from whom the land is frequently called in scripture; the second, Mesraim and his sons, who might reign there in the time of Joseph; and the king of another race might be a descendant of Caphtor, from whom the nation was afterwards called Egyptians. These were still reigning in the days of Moses, after whose retreat the kingdom was split into many sovereignties, and, as Sir Isaac Newton I think more justly asserts, was soon after invaded by the second shepherds, the Canaanites and Amalekites, who gradually usurped the greatest part of it, till finally expelled by Amosis or Thetmosis; the whole time in which the Israelites and the Amalekites dwelt in Egypt making up the 511 years during which the two races of shepherds ruled over that country, according to Manetho and Herodotus.

(aaa) Page 54.

Herodotus mentions not Nilus; but Phreron is so very like Phruron, that they are probably meant for the same person, to whom Nilus might be given as a surname. Indeed in all the historians of Egypt the names of kings perpetually disagree, which may be owing to their having had various titles. The only objections to this Phreron son of Sesostris being the same as Nilus, are, that the river of Egypt, which from him is supposed to have changed its name, is still called Egyptus by Homer after the Trojan war, and that Diodorus positively places him several generations after it. Indeed that historian adds many nameless generations to the list of Herodotus, between Sesostris and Amasis. In his time the Egyptian priests found it
necessary

to the ages of each of the patriarchs at the birth of their successors, as far as Nachor. The difference in the age of this last when Terah came into the world, is only 50 years; and this I am apt to think a mistake in the Hebrew. They both agree as to the age of Terah at the birth of Abraham. Small variations only are perceived with respect to the whole length of the lives of all these patriarchs, excepting 100 years which the Samaritan version adds to the life of Rehu; but Morinus pretends that this is only a mistake of a copy, not followed by all. On the other hand, this version subtracts 60 years from the ages of Heber and of Terah.

97 The Septuagint version differs from the two others by the insertion of another generation, that of Kainan. It agrees with the Samaritan in giving 100 years more to the ages of Arphaxad and of his five successors; and moreover adds the like number of years to the age of Nachor at the birth of Terah. It also prolongs by 100 years the lives of Phaleg and Sarug, and by 156 that of Nachor. Eusebius, Afranius, the Plantinian and Basil editions, add also 100 years to the ages of Arphaxad and Selah. With regard to the interpolated generation of Kainan, Mr. Count de Gebelin thinks it owing to the name and surname of Arphaxad, who might be called Arphaxad-Kainan, of which some copies may have made two distinct personages. As all the points of the life of this Kainan agree exactly with those of Selah; I should be more apt to believe that this surname belonged to him, who would then be denominated Kainan-Selah. This appears the more likely, as Arphaxad seems to be a name already composed of two words. It should seem that the Septuagint, having with the Samaritan added 100 years to the ages of Phaleg, Rehu, and Sarug at the birth of their sons, thought it necessary also to add the same to the whole term of their lives, which in both the Samaritan and Hebrew had so remarkably fallen off in duration from that of their predecessors. Thus in all the three versions these ages seem to have been varied according to the ideas and conjectures of the copiers, and are all equally subject to criticism, calling other circumstances to its aid.

(ddd) Page 60.

St. Jerom says, that several copies of the Samaritan version extant in his time extended the space between the creation and the deluge to 1556 years, differing only from the Hebrew computation 100 years in the age of Jared at the birth of Enoch; and he thinks this last difference imputable to the mistake of some transcriber. This is another instance of the alterations in these ages made by the mistakes or ideas of copiers.

(eee) Page 61.

Mr. Whiston's computation of the increase of mankind makes the number of souls in the 100th year after the flood to amount to 2048. Bishop Cumberland extends it to 3330, and father Petau to 37,448. Mr. Whiston's seems to me the most probable calculation; those of the other two, at least in their final numbers in about three centuries, are evidently exaggerated to an excess. But whichever of these calculations we should adopt for the first 100 years, the number of mankind at the expiration of that time seems evidently insufficient for the purpose of sending numerous colonies to plant extensive and remote regions.

(fff) Page 62.

Moses does not formally tell us, but it evidently appears from the sites which we find occupied by the distinct descendants of the three sons of Noah, that the brothers had agreed to allot to their several races the then known or surmised three parts of the earth. To the posterity of Shem, Asia proper from the Arabian to the Euxine seas, with Asia minor, seems to have been allotted. The rapacious sons of Chus, in violation of this contract, seem however soon to have possessed themselves by force of arms of the territory of Babylon and of the land of Chanaan. To Cham and his progeny seem to have been originally appropriated Sufiana (formerly called The Land of Chus, and now again called Chusistan by the original natives of those parts), Asiatic and African Æthiopia, and Egypt invariably called in Scripture The Land of Ham, with whatever lands might lie east, south and west of

those countries. Japhet's share was Media, the borders of the Caspian sea, and all the lands lying east or north of these, together with Europe at that time called the Isles of the Nations. The sons and grandsons of these three stocks, enumerated by the historian as fathers and leaders of nations as yet existing or known in his time, are 71. If we suppose the numbers of mankind to have been, as we have already shewn probable, about 2,000,000 at the time of the dispersion, the numbers under each of these several leaders will, one with another, amount to about 28,000. In these will be found a sufficiency of men in the prime of life capable of providing for the subsistence and of protecting the women and their numerous infant families, their flocks and cattle, during the long and dangerous marches the greater part were to make into unknown and very distant regions. Some such numbers were certainly requisite to colonize with ease and without evident distress countries as yet totally uninhabited. Nor can we suppose that men would have been induced to leave a country where all might yet live in affluence, had they not deemed that they might undertake the enterprise with safety, and already perceived by their rapid increase that the measure would shortly become necessary. Some persons have sedulously sought to spare these long and dangerous marches, by settling all mankind in the first instance within the precincts of Asia proper. We soon indeed find part of the race of Chus inhabiting districts of this, but we are given to understand that they were intruders on the property of Shem: we hear nothing of any of the sons of Japhet being settled in its confines, except in Media, alone originally attributed to Madai; all the rest of his posterity are dispersed, and are only to be traced in Europe, or in the north or north-east of Asia.

(ggg) Page 62.

Mr. Whiston computes only 262,000 souls in the 410th year after the flood. Bishop Cumberland raises them to the incredible number of 3,333,333,330 in the 340th year; and father Petau to the still more exaggerated calculation of 1,247,224,717,456 in the 285th year. Though the very excess obliges us to reject these last absurd computations, we must observe, that Mr. Whiston's

Whiston's *specimens* evidently below all probability in the natural increase of population at any period amongst men not entirely ignorant of cultivation, in a fertile country and favourable climate. How much more insufficient will it appear when the peculiar circumstances of the times are taken into the account! All the predecessors of Phaleg lived upwards of 400 years, and, as well as the three sons of Noah, were still alive in the 400th year after the deluge. By this it may fairly be supposed general longevity, mankind must have propagated four or five times as fast as at present. In some parts of North America population is supposed to have doubled in 25 years. It is true this quick increase is in some degree owing to the annual accession of European emigrants; but as we know these external recruits do not in fact bear any great proportion to the whole numbers of inhabitants, it must still be supposed that the natives themselves must have doubled in 40 years. In the year 1717 the Russian subjects were not computed at more than 20,000,000, and in the year 1763, a space of 46 years, with some accession of territory but very little of new inhabitants, their numbers (the conquered provinces not included) were proved on good grounds, the rates of head money, to exceed 20,000,000. This is doubling, in no favourable climate and in a despotic country, notwithstanding the devastation of several bloody wars, in the above-mentioned space of 46 years. How much faster must men have multiplied in the period we are speaking of, in the most favourable climate! Even if we suppose with some, which is neither necessary nor probable, that the age of puberty in those times did not arise till after the age of 100, there will be yet left near 300 years in the lives of men for propagation. To this we must add, that the original fathers were in general still living with their numerous descendants. At present a whole generation is swept away from the face of the earth in less than 80 years; but if the generality of those who composed the generations now past for 400 years were still living, and, instead of procreating to the age of 60, had continued to have children to the age of 350, which is less than proportionable to the longevity of men before the dispersion, the English nation would now be composed of 80,000,000 instead of 8,000,000. On all these considerations

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I think,

I think, that taking Mr. Whiston's calculation of 2048 for the probable number of souls in the 100th year after the flood, it will appear reasonable to double their numbers every 25th year for the next century, which will raise them to 32,768; and in the succeeding centuries to double them every 30th year, which will give us 2,097,152 for the 380th year after the deluge. Mr. Whiston supposes this same number in the space of 420 years, from a single stock, in his calculations of the increase of mankind from the creation to the flood: and I can see no reason why after that time men should not at least have arisen to the number of 2,000,000 in the first 400 years from three stocks.

(khh) Page 63.

We certainly are not to restrict the age of manhood to the period in which we find the predecessors of Noah or Abraham born. Thus, because Seth is given to Eve to replace in duty and piety her lost Abel, it would be absurd to conclude that the mother of mankind had lain barren near 128 years. No induction is to be drawn, from some of the first progenitors of Abraham being born about the 130th year of their fathers, that such was at that time the usual age of puberty. Before the flood, when the age of men was double to that of those who were born after it, we find, both according to the Hebrew and Samaritan versions, Mahalaleel and Enoch born in the 65th year of their fathers, and, according to the latter, Lamech in the 53d year of his. An analogy is pretended from short-lived animals, who in proportion arrive so much sooner to maturity than man. Naturalists agree that parrots, ravens, and eagles live beyond the present age of man, and yet we do not perceive that they attain their full vigour much later than other birds of the same size. Man, when he lived above 400 years, might be stronger in body as well as constitution; but we cannot reasonably suppose that the age of manhood was more than 25 in climates where it is now at 15. Neither are we to conclude, because Abraham, Isaac, and Jacob were childless at an advanced age, that such was the common case. It was not from the usual course of nature, but from the divine Providence, that these patriarchs

patriarchs were to expect the numerous offspring finally promised to them. The faith of Abraham was tried by such dispensation, and so was probably that of his immediate successors.

(iii) Page 64.

To avoid this, some have supposed a second migration for Joctan and his sons, as well as the establishment of kingdoms prior to the general dispersion. It has been also contended, that the erection of the tower of Babel is to be attributed only to the revolted sons of Chus; but all these suppositions are in direct opposition to the text and plain meaning of Scripture, and calculated merely to support particular hypotheses.

(kkk) Page 66.

Overgrown empires have ever been the chief cause of the devastation of the earth. Provinces lying beyond the immediate reach of government are delivered over to the rapacity of governors, who destroy the very seeds and dry up the sources of population.

In a fertile kingdom of moderate extent, should sudden pestilence sweep off at once a fourth of the inhabitants, the loss, however grievous, under a mild and attentive government would disappear in less than 100 years. But where a barbarous, ignorant, and indolent despot reigns over far extended provinces by a succession of delegates, whose extortions fear obliges him to dissemble till excesses render them odious, and their treasures are become worthy of the royal coffers—in such a government population will be reduced to one half in the same space, never to be replaced. Of this sad devastation we have a striking example before our eyes in the present Ottoman empire. Mahometism, in the torrent of its sanguinary conquests, laid waste countries formerly the most fertile and the most populous of the earth. The ferocious successors of Mahomet, in dismembering this first empire, continued the desolation during some centuries. But no sooner were sovereignties of moderate extent established, than these losses were in some degree repaired.

repaired. A new swarm of Tartars soon again overran a part of these; and the more savage Turcomans, seizing these half-ruined kingdoms, and extending their ravages over the whole of the enfeebled Grecian empire, completed the general ruin by a mode of government whose internal vices render it daily more destructive. Where are now, alas! those flourishing cities which, 1600 years ago, covered the populous face of Greece, of Asia minor, of Syria and Mesopotamia, of Persia, Palestine and Egypt, and of the northern coasts of Africa? In the midst of deserts, traversed only by roving Tartars and Arabs, a few mouldering ruins mark the seats of ancient wealth and magnificence, once the boasted capitals of mighty kingdoms. Of how many are even these feeble traces totally obliterated, leaving the puzzled antiquarian in doubt where to place their ancient sites! Paltry towns scarce deserving the name of villages, whose miserable houses, scattered amongst heaps of ruins, are upheld by remnants of the noblest monuments of architecture, are yet dignified by the names of Athens, or of Alexandria. The trade of Europe, for a scanty part of those valuable products which the neighbouring countries might produce, still upholds the population of a few maritime towns; but even these remaining signs of prosperity would long ago have disappeared, were not their rapacious tyrants sensible, that in losing that commerce they would for ever dry up their only remaining source of peculation. Mr. de Volney asserts, that in the pachalic of Aleppo, out of 3200 villages entered in the registers of taxation two centuries ago, 400 only remained charged with the payment of the whole tribute. Should this destroying power continue to exert the same fatal influence a century longer, it is probable that the whole of that fine part of the world, once the nursery of mankind, will become a frightful solitude abandoned to a few wandering Tartars and Arabs. Though nominally yet part of the Turkish dominion, the greatest part of interior Asia is already at the discretion of these robbers. Let us in Europe give thanks to Providence, who from folly knows how to draw forth blessings. The crusades were absurd expeditions still more absurdly conducted; but they were the cause of delivering our towns from the miseries of feudal bondage.

dage, of overturning petty tyranny, and of disseminating the first rudiments of arts amongst our barbarous ancestors. By timely diversion they rescued Europe from that impending desolation which has annihilated the neighbouring countries.

Why did not, it may be said, the Persian empire, as extensive as the Ottoman, produce the same devastation? Population certainly suffered much from the distant expeditions of Cyrus and of Xerxes, and millions of men were sacrificed to their inordinate ambition. But those evils were transitory : these despots were neither so barbarous nor so ignorant as the Sultans : oppression had some bounds. It appears that the Grecian cities in Asia minor, and in many distant provinces of that empire, still preserved their natural chiefs and laws, and were only subjected to certain tributes, and to furnish a certain number of soldiers in time of war. The satraps carried not into the provinces powers entirely unlimited. The empire itself lasted only 210 years. Had it lasted longer, it is probable that the same abuses finally introduced would have brought on ~~the~~ *that* same general devastation which now consumes the Ottoman dominions. The conquests of Alexander, scarcely finished, were divided into separate kingdoms ; those of Syria, of Egypt, and Macedonia, became flourishing monarchies, till the power of Rome swallowed them up with almost the whole then known world. It is well known that under these new masters the distant provinces were grievously pillaged ; but a policy peculiar to them guarded them from total destruction. That people every where established military colonies, who enjoyed great freedom and privileges : and the rights of Roman citizens, granted to towns and to whole provinces, protected great numbers from the indiscriminate depredations of its proconsuls. The Romans, solely intent on the military profession, abandoned to the natives a free and uninterrupted commerce ; internal peace repaired the ravages of partial depredations, till the moment when the more frequent quarrels of competitors for the empire shook and undermined that colossus, which finally sunk under its own weight. I am apt to think that the age of Alexander, or that which

immediately followed, was the era of the fullest population in western Asia. Excepting Greece and part of Italy, which last then began to rise from a state of mediocrity, the rest of Europe was yet as thinly inhabited as Asia had been 15 centuries before. One might perhaps fix upon the reign of Trajan as the time of the greatest population in all that part of the world then subject to Rome. Since two or three hundred years the gradual decline of feudal anarchy, the rapid progress of agriculture, arts, and manufactures, under more mild and polished governments, have probably increased the general population of Europe, especially in its northern parts, 50,000,000 of souls; but since 15 centuries, that of Greece, of western Asia, and Africa, fallen under the most destructive yokes, has probably lost four times as much. Lately Spain alone has fallen in its population, by extending beyond measure its dominion over America, whose ancient inhabitants it barbarously destroyed. It is thus that prosperity and decline, population and depopulation, succeed each other on this earth in proportion to the moderate or excessive extent of empires; in proportion as governments are wise or corrupted, as the happiness and liberty of man are more or less regarded and respected. To what extent are the rulers of nations accountable to the justice of the great Creator, who, ever bounteous, still equally spreads his blessings for the happiness, enjoyment, and increase of mankind!

I have said, that Europe upon the whole contains 50,000,000 of inhabitants more than it did in the time of Julius Cæsar. It may be curious to exhibit a table of the most approved calculation of population in this part of the world in the present times, compared with the utmost probable calculation which the state of the same countries in the time of that Roman emperor will admit.

	At present.	In the time of Cæsar.
	Millions.	Millions.
British islands	11	3
France, Low Countries, and Holland	30	10
Germany, Switzerland, and Hungary	38	10
Sweden and Denmark	6	1
Poland, Prussia, and Russia	35	6
Spain and Portugal	13	10
Greece, Archipelago isles, and Turkey in Europe	9	30
Italy, Sicily, Corfica, and Sardinia	18	35
	160	105

Cæsar informs us that in England, except the somewhat better peopled country of Kent, great part of the island was overrun with woods, and that the inhabitants had rather palisadoed camps than towns. Gaul seems to have been more completely inhabited, and, in an age when every man able to bear arms was a soldier, frequently opposed numerous armies to his progress. Germany was in a much more rude state, half covered with immense forests. The inhabitants of the more northern parts of Europe, known only by irruptions from time to time on their more advanced neighbours, were yet nations of hunters or shepherds. Every one who considers the great progress of population within this century must be convinced of the immense difference between the state of all these countries in his time and in the present. The vast increase of our towns, of our agriculture and commerce in England, notwithstanding the boding calculations of some authors, must point out a great increase of population within these last hundred years. In Lewis the fourteenth's reign the inhabitants of France were never esteemed to exceed 18,000,000, and at present they are computed at 25,000,000. The state of Germany, particularly of its northern parts, is still more improved in proportion. Towards the end of the reign of czar Peter there could only 5,000,000 of males be found subject to head-money; in 1783 there appeared above 12,000,000 paying it in the same provinces.

provinces. Spain and Portugal have gained little, and by their emigrations to the East and West Indies have lost much within the last two centuries. On the other hand, Italy, though still on so large a surface the best peopled country in Europe, has certainly, especially in its southern parts, lost more than half its inhabitants since that age, in which it was mistress of the western world. Savoy and all its northern parts have probably rather increased than diminished their population. But Rome, which, when the capital of the world, might probably contain between one and two millions of souls, is now reduced to 160,000. Campagna Felix, and the country from Tivoli to Naples, have probably lost two-thirds of their inhabitants; and the same may be said of Sicily. But many erroneously attribute to the papal government the whole of the desolate state in which we see great part of the country in the neighbourhood of Rome. Much, no doubt, is owing to the inefficacious rule of a succession of old men governed by nepotism or artful courtiers, to the ignorance and supineness of the great proprietors, and to a constitution where industry is not the surest way to riches and honours. But I will boldly affirm, that the most striking parts, the whole plain between Rome and Tivoli, and the Pontine marshes, never were or could be in a much better state than at present. I have walked over in shooting great part of the plain between Rome and Tivoli; and the soil, which consists of a deep white crystallized sand generally covered with a coat of black sand not half an inch and oftener not a quarter of an inch deep, evidently proves that it never could be in a state of ordinary cultivation. Immense expence may have carried soil to some spots to make gardens; but even that adventitious fertility could not be of long duration: it would soon disappear and vanish through the hungry unconnected sand beneath. Accordingly we find these parts covered for a mile or two with tomb-stones, a use for which it was more proper than for cultivation. Horace's journey to Brundisium sufficiently indicates the poor state of great part of the country, and of the Pontine marshes, in the Augustan age. Virgil extols as one of the glories of the reign of Augustus, his having drained those Pontine marshes, which he effected by deepening at great expence the port and road of Ostia, in order

to receive the waters of the drains. But history soon shews us of how little avail this was. In the very beginning of the reign of Tiberius we find that emperor laying before the senate as a question of great magnitude, whether this port and these drains, already choaked up, were worth the expence of repairing. It was unanimously decided, that the first and constant necessary expences would far exceed the advantage. The present Pope Pius the sixth has again attempted to drain these unprofitable and unwholesome marshes. Whether any improved inventions in the art will be able to effect it, time must shew. These lands are very little above the usual level of the Mediterranean: every winter storm constantly overflows them with its waters, and the fall is so very small that there is never time for the waters to run off. If that sea had considerable tides like the ocean, there would be no difficulty by means of sluices to let them off at the ebb, and exclude them in the flow. But in this state of things any permanent success must be doubtful. Marshes of the same kind in Tuscany were endeavoured to be drained in this century by 6000 Lorrainers, who followed their sovereign; but in the course of 30 years not more than 40 families of these remained; the rest perished in the unwholesome task, much more destructive in hot than cold countries. The tyranny of the Ottoman government accounts for the great fall in population I have supposed in the territories under its dominion.

(III) Page 70.

War, that scourge which man must impute to himself alone, waited not long after the death of Noah escaped from the flood to break out amongst his children still struggling against the disasters of degraded, dislocated, and yet unsettled nature. In the antediluvian world we are told indeed of private murders; but whilst the earth continued such as it came out of the hands of the Creator, and every where afforded plenteous subsistence to its inhabitants, that public crime, occasioned by the contention for some happier spot, is not at least recorded. The vanity and false glory of princes are accused of giving it birth. But why throw the fault on them alone? The desire of celebrity and of captivating general esteem is natural to man.

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Let a sovereign ask, I say, not of a courtier or a warrior by profession, but of a peaceable citizen, of a philosopher, who are the kings the most celebrated in history, he will hear a Cyrus, an Alexander, or a Cæsar instantly named. When flattery aims to dazzle him, it equals him to this last, who boasted to have been the murderer of a million of men in pitched battle, and to have, no doubt, caused as many more to perish in the disastrous consequences of war. This calamity is often immediately due to the folly of princes; but that is originally excited by the senseless prejudices of the people, who exalt the conqueror above the just and peaceful sovereign. It is not then kings who must in the first instance be cured of this warlike madness; the words of wisdom itself will be unavailing against the torrent of general opinion, strengthened by the particular interests of those who surround them: it is in the people themselves that that prejudice which attaches fame to the sovereign covered with the blood of his subjects and of his neighbours, must be rooted out. Republics, Rome, Carthage, Sparta, Athens, have been no less guilty of this crime. I wish I could except my own free country. Alas, popular cry has more than once forced administrations into unnecessary wars, and has punished those who dared to put an end to them. Will neither princes nor people be at last convinced, that a province added to their sway can add nothing to their real happiness; but that the efforts made to acquire it will infallibly, in these days particularly, when war is become so expensive, dry up the resources and prosperity of the conquerors? I know but one king, and for that alone he might be justly fainted, who had fortitude enough to yield up whole interesting provinces rather than contend for them without strict right. The fame of his justice made him, without acquisition, the venerated umpire of Europe. Had he violently seized or retained the property of others, he would have been the object of its jealousy and terror: and this consequence of haughty injustice is not sufficiently attended to. I have all my life been astonished at the elogiums enthusiastically heaped upon the Spartans and their government, by almost all authors of history and even of morality. Is it then so difficult not to be carried away by the number and authority of suffrages; or are martial va-

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lour and the contempt of death with all men the sublime of virtue? Without being swayed by authorities, or dazzled with these single qualities, how can we extol beyond all others a legislation which, to concentrate every passion in zeal for the country, dared to break asunder the dearest ties of nature, parental and filial love, by making them strangers to each other; as if on these first ties of nature, and their multiplied links, all love for our country was not originally founded? Under the pretext of rooting up shameful inclinations, it ordained the public neglect of that modesty which constitutes the first charm of the fair sex. Can we conciliate with morality or virtue laws which encouraged theft, provided it was subtle; which authorised murder in cold blood on the persons of disarmed slaves, rendered still more defenceless by intoxication? For it was thus that the horrid policy of Sparta hardened her youth to blood, and guarded herself against the dangerous increase and despair of those beings, rendered tenfold more unhappy there than in any other state. It was thus that she for ages treated the miserable Ilots, literally there the hewers of wood and drawers of water. Neither can I give the Lacedemonians credit for that boasted frugality which had not virtue or moderation, but military discipline alone in view. The Athenians, who made it not a law, knew how to be as sober when occasion required, and their military exploits are not inferior to those of the Spartans. The disdain for riches, more pretended than real, of that people touches me not more. An indolent life suited them better than the labour to acquire them. Their slaves sufficed without any exertion of their own to procure them plenteous though simple subsistence. How many savage hordes have the same frugality, and on the same motives! Their legislator, whose hard and stoic heart was not accessible to the real charms of virtue, had calculated that it was easier to bear the total privation of what is called riches, than to have the courage to lose them. Shall we prove how little this republic was truly disinterested? Notwithstanding the glory which 300 of its citizens acquired in dying at Thermopylæ, that passage once forced, the Spartans, abandoning all the rest of Greece, retire home to defend their miserable huts; whilst the Athenians, sacrificing themselves entirely to the

general safety, devote their palaces and their sumptuous furniture to certain depredation. Ever ready to withdraw their ships in order to cover their own possessions, it was Themistocles who by stratagem forced them to fight at Salamine. How narrow and how selfish was that patriotism to which every other virtue was thus sacrificed ! The city of Sparta began by annihilating by force the rights of every other city of Laconia, in order to concentrate all authority within its walls. It invaded the Messenians, not to increase the subjects of its dominion, but to oppress under its galling yoke slaves treated, not only in the first moment of conquest, but for ages, with an indignity and a cruelty elsewhere without example. Basely jealous of their privileges, the Spartans preferred to see their republic gradually decline for want of citizens, to strengthening it by the communication of equal rights to other men. With that strict military discipline and that contempt of death (sole education of their youth) they naturally should have subdued not only all Greece but the whole earth ; but notwithstanding their thirst of dominion, they never could extend their rule beyond the narrow limits of the Peloponnesus, because they never had the generosity to incorporate either allied or conquered people to increase the number or repair the loss of citizens. If their noble rivals, the Athenians, had not been counteracted by their jealousy, they would alone have overturned the Persian empire, not so much by arms as by communicating their social virtues, their talents, and their glory, to the extremities of Asia. Had Sparta known how to conquer nations, she would have trodden them under foot and sunk them into abject slavery : had Athens subjected them to its power, it would have ennobled them by liberty, science, and the fine arts ; and the world would have been civilized some ages sooner. Through mean selfishness the Lacedemonians missed the end of that ambition which was their only passion : the more magnanimous Romans attained it by associating successively to their privileges every province they found worthy of them.

We are tempted to despise those petty conquerors who ravaged petty
territories

territories in the days of Abraham; we are surprised to find in Homer's *Odyssey*, that the old heroes of Greece placed their glory in plundering indiscriminately the ships and coasts of every nation. The names of the buccaneers of the Antilla islands, who renewed these scenes 200 years ago, are forgotten or devoted to execration. We disdain the chiefs of a small number of plunderers, and yet we persist in ranking amongst men of a superior order those sceptred conquerors whom chance had enabled to lead vast armies to more extensive carnage, to depredations more fatal but not less iniquitous. It is by dint of brilliant injustices that free nations themselves have aspired to celebrity and to the respect of mortals. Their glory rises in history in proportion to the number of their warlike crimes. And it is thus that yet thinks the boastedly enlightened 18th century! The dawn has only yet shone upon it; but sounder reflections often repeated, and above all some late events, may bring the next to fuller light.

The wild theories of infidel philosophers have been essayed in practice in a neighbouring country; and such have been their baleful consequences, that it is to be hoped they will deter all future ages from a repetition. These upstart rulers, of whom pride, the true foundation of the sect, formed the leading characteristic, began their reign by tearing up all former establishments, violently breaking down all the rooted prejudices and habits of men, and by rejecting all the knowledge and experience of past ages. All these were to yield to such consummate wisdom; even to its future dictates they required beforehand the assent of the present age; and they had the further folly to proclaim them binding on posterity. Unpremeditated laws, passed without discussion in the midst of tumult and clamour, and often forced upon the majority by the menaces and vociferation of an attendant mob, were even to be looked upon by themselves as infallible and irrevocable. To this point of honour, or rather of vanity, they hesitated not frequently to sacrifice the tranquillity and the dearest interests of the kingdom, and to endanger that very intended constitution which they held so sacred. To this set of sages it devolved to give the first example of such absurd and determined phrensy.

phrensy. More enthusiastic and more sanguinary devotees of infidelity than the most furious zealots had ever been of any creed, their first batteries, as soon as they were firmly seated, were aimed at all religion. Its rich spoils held up to a bankrupt nation and to the needy, and every species of corruption practised on unthinking mobs, were to sap it to its foundations. And they succeeded beyond all expectation. They dared not indeed yet openly to renounce all religion; but they hoped by an insidious oath to vilify the ministers of the established church, or to seclude them from their functions. They evidently flattered themselves to be able to rule a mighty kingdom without religion and without morality. To delude the unthinking multitude to their purpose, the rights, not of social but of independent isolated man, unbalanced by any corresponding duties, were declared to be the foundation of all law, the true catechism of society. It needed not the sagacity of a Burke to prophesy the effects of such a doctrine on a corrupted nation. That a constitution, whose basis was thus founded on the principles of anarchy, should obtain the smallest credit with the thinking part of mankind, seems incredible; but the means of making it palatable to the mob were not unpromising. Perfect adepts in the knowledge of vulgar inclinations, no less expert in directing than in rousing the accelerating force of unbridled passions, these philosophical politicians had in a few months fitted the mob to every horrid purpose. No lure that could gain proselytes was omitted. To vanity, that first seducer of the human heart, and perhaps peculiarly so of every French one, large application was made. The sovereignty of the people was so loudly sounded and so frequently repeated, that every beggar dreamt himself a king. Some petty share of power and consequence was distributed, not to thousands but to hundreds of thousands*. In all these multiplied offices every one might hope

* The kingdom was divided into 83 departments having each 11 administrators, these into about 3000 districts having seven, and these again into 44,000 municipalities having five each. Add to these 6000 justices of peace, and near as many judges: in all about 260,000. The qualifications for primary electors were such as to extend the right to every man not an absolute mendicant.

hope to strut by turns his day, and the man without a shilling might aspire to become a supreme and well-paid legislator. That no old prejudices of rank might impede the progress of equality, nobility was proscribed. In this the monied men, whose vanity was wounded by every other distinction, heartily concurred. They were not aware that soon the aristocracy of riches would be deemed as dangerous as that of birth. These were self-seduced, but it was to the lowest classes that these leaders of sedition chiefly attended. To corrupt them, they borrowed the purses of these deluded men of wealth, and of an ambitious and flagitious prince of the blood. The army was debauched by licentiousness, and the soldiers were encouraged to expel their old, and to elect new officers. To obtain entire sway over all the lower orders of men, every remnant of gratitude

mendicant. Their delegates had not only the nomination of national representatives and of all these numerous annual administrators, but of sexennial judges, of bishops, curates, and vicars, the two last amounting to 80,000. To these preferments must be added those of the numerous officers of every rank of innumerable national guards elected amongst themselves, and that of officers in the army chosen by the soldiery. Thus the patronage of the mob was indeed immense. Multiplied self-constituted clubs should not be forgotten. And some of these are well known to have dictated to the national assembly itself. To suppress their rival power those arrogating senates were unequal. To these rulers the republican government soon added a still more formidable set, consisting, as at first observed in the convention, of 90,000 members of revolutionary tribunals; but, as it has since appeared, together with their attendant revolutionary armies, amounting to 250,000. It also appeared, that these had cost the nation in the year 1794 no less than the enormous sum of 600,000,000 French, or 26,000,000l. sterling, over and above depredations, which are supposed to have amounted to the value of at least an equal sum. Under their former government, not only the petty clerks of office, but the footman and scullion of every man in power, were anxious to display their share of influence. Not only the bailiffs but the annual collectors of villages were no less intent to exercise their day of authority; and the farmers of revenues made ample use of this propensity for the purpose of squeezing the whole peasantry by turns. As every traveller must have experienced, every post-boy was eager to exert his power of control over the man who paid him, even at the hazard of that recompense, which he never thought sufficient for his services. Judge then what must have been the insolence of office so diffused, of patronage so universal. It is worthy of remark, that formerly every smatterer in literature looked upon himself as belonging to a distinct and most exalted profession. In the new order of things, they deemed themselves the gods and real rulers of the nation: but the mob of sovereigns disappointed these as well as the sages of the constituent assembly.

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was from the very first industriously proscribed. To this end the fury of the mob was by hirelings, posted for the purpose, peculiarly directed against all those who had been most conspicuous for the benevolent use of power or riches. The indecent flagellation of nuns, devoted to the most humble and charitable offices of humanity, was prompted to those very persons whom they had attended on the bed of sickness. The popular mind was to be weaned from gratitude, and gratified by the exposure of modesty to public shame. The multitude was daily plunged into new crimes, to prevent return or remorse. The most audacious lies, bribery, rapine and plunder, prostitution in defiance of all decency, massacres attended with circumstances the most shocking to humanity, were the ready auxiliaries of these reformers of government—of these teachers of morals unadulterated by superstition—of these establishers of toleration, of national concord and prosperity! As a remedy to the abuses of monarchy, they consecrated the barbarous and speedy justice of the mob by unqualified applause. It was necessary to terrify their adversaries and bear down all opposition. Called together under the antient form of three estates by a virtuous king who hesitated not to circumscribe his own power for the welfare of his people, these reformers had immediately reunited all three into one despotic assembly under the empty shadow of monarchy, and called in the needy, the turbulent and licentious of all descriptions to strengthen their usurpation. The remedying the finances of the state, the first object of their mission, served only for a pretext to plunder the clergy and nobility, and was never more attended to. The destructive expedient of base coin and forced paper money renewed with a profusion hitherto unknown, pretended free gifts to the amount of one fourth of the income of all property productive or unproductive, were the sole testimonies of their financiering abilities. The destination of these spoils was not, to redeem the state, but to bribe and corrupt the lowest classes. Though the credit, the commerce, and manufactures of a mighty kingdom were beyond all example completely ruined in the space of 18 months, that numerous part of it which they had declared the real sovereign, and by which they hoped to rule, was to be gratified.

gratified. These first artificers of anarchy were not aware that such a mob let loose from every tie would never more be bridled, and that they themselves, as they soon after experienced, would be the first victims to the tyranny of its temporary favourites. Each leader hoped indeed to be that favourite; but those who now appeared at the head perceived not that more determined and more artful villains, whom they had deemed subordinate, but whose tools they really were, would rise upon their shoulders, and finally subject to the axe such of them who should not escape by flight. Such were the steps by which philosophy mounted to the throne; and its votaries finished their career of government, by concluding a constitution they fondly deemed a master-piece of human wisdom, and each article of which in the vanity of their hearts they foolishly decreed should remain unalterable for 30 years. These were succeeded by an assembly called Legislative, composed, as might well be imagined from the prescribed mode of election, almost entirely of members without property, of shallow abilities, but not less devoid of religion and of every principle of honesty. They without hesitation swore to maintain that constitution they were predetermined to overturn. The real conspirators against all property and order stood behind the scenes to direct these puppets at will. The first assembly had with philosophic hypocrisy declared, that France renounced for ever all extension of territory, though its last act belied the assertion by the forcible seizure of Avignon and the Comtat, by means the most horrid and flagitious. This publicly announced, that it was ready to abet, support, and unite to it all who should in any part of Europe rebel against their whatever form of government; every country was filled with emissaries to foment sedition. Needy sets of fugitives from the Netherlands, from Holland, from Savoy and Nice, offered the union of their native lands; and the offer of these mock delegates was sufficient ground to send their armies to subdue or rather to plunder those countries. In spite of the solemnly decreed inviolability of the king's person, the succeeding convention imprisoned, and, after a mock trial before these predetermined judges, brought to public execution their innocent king, who had patiently suffered every

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insult and humiliation, rather than be the occasion of spilling one drop of his subjects' blood. His consort was to follow him to the same scaffold some months after in a still more ignominious manner. To prepare the nation for this last catastrophe, without the sanction of this mock assembly, the royal guards were massacred within its hearing and within its precincts, by the orders of an unknown band of ruffians, who, in fact, had already resumed out of its hands that sovereign justice which it had declared ultimately to belong to the rabble. Encouraged by success, the proscriptions of obscure attorneys or tradesmen, of a Petion, a Danton, a Robespierre or a Santerre, were as extensive, and as regularly, though much more barbarously, executed by a few hundred banditti, as were those of a Sylla, an Anthony or an Augustus, at the head of conquering armies. All the virtuous ministers of religion who could be laid hold of had been previously imprisoned, and were inhumanly butchered. At the same time all the crowded prisons of the capital were eased, by unheard of barbarities, of all their wretched inhabitants, from a princefs of blood royal to real malefactors. The number of persons murdered in Paris alone amounted to several thousands. To enumerate the unheard of cruelties, exercised in all parts of the kingdom successively during the remainder of this anarchy, would fully the page of history. All this was executed without any known authority, in the midst of numerous armed citizens, who quietly looked on to see their relatives and friends butchered before their eyes. Such a series of crimes is a disgusting specimen of the enormities to which the doctrines of modern freethinkers can lead, and is a proof of that entire degradation to which egotism and the loss of principle can sink what is called an enlightened nation; that is to say, a nation in which every one has a smattering of knowledge sufficient to make him vain and presumptuous, and a despiser of those old prejudices, religion, probity, and honour. May it be an eternal and last warning to posterity! May nations yet unborn shudder at the relation of crimes which are the natural and certain consequences of principles releasing man from every duty! This third assembly, composed of the most able and determined ruffians, after having declared France a

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republic, in which every individual should be perfectly equal, exhibited to affrighted Europe the bloodiest scene of tyranny and oppression the world had yet beheld. This too framed a new constitutional code, which, with the same breath, they for the present, as in time of danger, set aside to give way to what they called revolutionary laws. It soon appeared to be split into two factions, who agreed in nothing but in the lust of plundering, in the open denial of a Godhead, and the utter detestation of all religious restraints. One of these was called the Mountain, aptly assimilating the faction to a volcano vomiting forth flames, ruin and desolation. This party soon became absolute, by proscribing and cutting off the heads of its rivals; and in this slaughter Providence seems particularly to have involved many of those who had first determined, and all the ministers who had signed, the death warrant of their king. Amongst these too fell the detestable duke of Orleans, who had nearly exhausted the noblest fortune ever possessed by a subject, in exciting the mob to deeds of horror. Under the iron rod of these monsters, in the space of a few months as many hundreds were imprisoned or butchered in cold blood, as the bitterest Tacitus could have counted individuals in as many reigns of the most bloody tyrants. The former assemblies had only confiscated the property of the clergy, and of those nobles they had driven into exile: this at once declared both the persons and the property of every kind, of the whole nation, in a state of requisition; that is to say, at their immediate disposal. By forcing, by the terrors of instant death, all who were capable of bearing arms into their armies whenever called upon, and by seizing all property to defray the expences, they were enabled by superiority of numbers to make head against the best disciplined troops in Europe. Even those who were driven into them the most reluctantly were soon corrupted by the contagion of licentiousness; and either in despair, or imbibing the industriously propagated doctrine of no future life, and further intoxicated by phrensy-working liquors, they rushed on with almost irresistible fury to death or victory. Robespierre, that most atrocious of recorded tyrants, has met with his deserved fate, and a milder system of government has since obtained. Still it may be feared, that the necessity of raising money will

again bring forward the reign of terror. A third constitution has been adopted, by which the pretended sovereignty of the people has been much abridged. It has been excluded from the free choice of two thirds of the members of the councils. This was not effected but by the massacre of more than 2000 persons at Paris. By this bold measure the present rulers have secured to themselves and their friends despotic power. The directors, under various pretences, have at the same time discharged in most of the provinces the magistrates elected by the people, to fill their places at their own nomination. Regardless of the unexampled miseries of the country, these chiefs will at all hazards strain every nerve to retain their conquests in Belgium, ~~so~~ dangerous to the tranquillity of all Europe, and so utterly incompatible with the safety of Great Britain; their real aim is not so much to exalt the power of France, as to prevent the return of their armies into its bosom. By preserving these conquests, they might disperse in these distant provinces the greatest part of those lawless banditti, by dividing amongst them the rich spoils of their clergy and nobility, or by detaining them there as necessary garrisons. On the approaching campaign probably hangs the fate of Europe, and of Great Britain in particular. The God of peace and of armies, who holds in his hands the hearts of men, can alone decide the contest, and, by disposing to order and tranquillity the great body of the French nation, put an end to the calamities of Europe. In the mean time, the utter desolation of the not five years ago most flourishing kingdom affords the most striking example of that direful vengeance, which God has so often in scripture denounced against those nations who shall collectively dare to abjure his name. May the Almighty, in his mercy and justice, efficaciously screen Great Britain, whose conduct has been in every respect magnanimous, from the hands of barbarism! We may surely hope that the divine Author of Christianity will grant his peculiar protection to a nation which has so conspicuously practised his sublimest precepts, by receiving and relieving with unbounded liberality and generosity thousands of persecuted ministers of religion, though of a persuasion different from its own established church. God will have pity at length too on those whom he has

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hitherto abandoned to the folly and perverseness of their own hearts; and this disastrous philosophical attempt, to frame a government without religion, will afford a salutary lesson to all governments, and to mankind in general.

The less visible, though not less efficient, cause of such disorders was the dereliction of all religious principles. Originating in the corruption of a dissolute court, it had been thence gradually diffused into all ranks of society, and had been long sedulously promoted by writings of every kind, addressed to every degree of understanding, all equally tending to scout the idea of divine interference in this world of chance and hazard. Such had before been the effects of sceptic philosophy in Rome. Such notions once pervading the great mass of the people, it stood prepared to throw off indiscriminately, as equal prejudices, every remaining tie which united it in confraternity or bound it to authority. Hence that egotism, regardless of family, friends or posterity, long justly complained of in France: hence that want of principle of any kind, of steadiness and fortitude so conspicuous during these commotions throughout all classes, even in that in which honour was a religion. The philosophic sect, secure in the principles of its satellites, alone remained firm, undaunted, and prepared to meet all obstacles. It met but few indeed in the spirit and courage of its opponents. The superior clergy had been, not without cause, though with many exceptions, accused of morals very discordant with its doctrines. But though practice had been greatly neglected, some principles either of religion or of honour still remained in that order; and from it, hastily attacked in this last entrenchment, the assembly met with a check which it had not expected. On the contrary, the inferior class, who had been generally better thought of, inveigled by the lure of vanity and petty interest, had early seemed to desert its banners, and imprudently given its weight to the common enemy. In justice to it, it must however be remarked, that as soon as an oath was tendered, which was deemed incompatible with duty and principle, the great majority of its members, as well as of those of higher ranks,

ranks, nobly rejected it, at the hazard of losing that bread which many of them afterwards became day-labourers to obtain; and many who had at first been surprised into it, notwithstanding the now manifest consequences, as nobly retracted. From the loss of property, of honours and respect, amidst want, insult, and unexampled persecution, the great body of the clergy rose superior to dangers and unsubdued by its all-powerful enemies. Its submission when interest alone was concerned, its resolute resistance when principle was attacked, its patient sufferings prove the force of religious principles once imbibed when put to the test, and the security they alone can give to lawful government.

The more immediate and more prominent cause of this great explosion which at once levelled all respect and authority, of this astonishing revolution as well in the minds as in the manners of men, was the misery and despair of the people at large; to which was added the illiberal treatment of the soldiery. The finances were deranged beyond the power of temporary expedients, by a load of debt accumulating for more than a century from the expences of ambitious wars. In the midst of public and it was thought irretrievable distress, the profusions of a dissipated court were flagrant and increasing, and seemed to laugh at misery. The most oppressive taxes, from which the most opulent were in many cases exempt, levied in the most oppressive manner, ground the face of the people, whilst the increasing luxury of courtiers and men in office rendered more bitter the cup of squalid poverty. The higher clergy, ever taken from the nobility, deserted their flocks to follow the unsuitable pleasures of the capital, or loiter in the antichambers of power, and in their short residence in their dioceses exhibited the ostentation and sumptuousness of courtiers. Even the poor nobility made themselves some amends for want of fortune, by haughtiness and insolence towards their inferiors. The courts of justice, still more proud in their demeanour, were suspected of prevarication in favour of power, opulence or rank. Such were the heavy grievances which called for redress. A constitution planned upon the experienced one of England, but
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in many instances improved, was the unanimous wish of all orders, and would have been carried without a dissenting voice; but it suited not the views of philosophers and lawyers, whom the tiers état on account of talents and habits of speaking in public had unwarily deputed. They violently wrested the whole uncontrolled power into their hands, contemned the free and moderate wishes of the nation, assumed ungiven powers, and pulled down all authority to raise a fabric of their own. Whilst the tiers état was yet trembling in abject submission, the nobility and parliaments alone had raised the standard of liberty, and resisted at their sole hazard arbitrary power: the king benevolently consented to have his authority, abused by ministers and courtiers, limited. The return to all was annihilation: the throne, the clergy, the nobility and parliaments were at once, as by a sudden hurricane, overturned by those who had hitherto appeared so dastardly.

Hence governments may learn, that when all appearance of respect to religion is thrown off at court, or amongst the rulers of a nation, the like contempt will at last descend to every rank of society; and that, religion once effaced from the consciences or minds of men, no tie remains which can bind them to authority, order, or subordination; that the religion adopted by the state should be upheld and maintained with sacred veneration, and made respectable by the choice of its pastors; but that to bend the private consciences of men to civil authority is to foment unconquerable discontent, which will sooner or later break out in acts of violence; that personal liberty and property, whatever be the mode of government, should be sacred and inviolable; and finally, that wars of ambition, whether undertaken in the view of extension of territory or of commerce, the profusion of courts and licensed rapine of courtiers, or of those entrusted with the public treasure, by laying insupportable burthens on the people, must at length occasion such general revolt, as will overturn government and throw the whole state into despair and anarchy. Let kings at last be convinced, that not numerous armies, but the good will and happiness of all their subjects,

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can support their thrones. Warned by the convulsions of one kingdom, and the eminent hazard of a like fate throughout all Europe, let sovereigns, at last content with the dominions which Providence has subjected to their rule, unite in concord, and dismiss those supernumerary troops which ruin and dry up the finances of the state, and lay upon the poor an intolerable load of misery. They have seen that numerous armies, ill treated and ill paid, may be turned against their chiefs, whilst a moderate number of troops, regulated but not harassed by discipline, and maintained with comfort and decency, will be a faithful and invincible shield against every unprovoked revolt. By this great example, to which may be added that of Joseph the Second of Austria, reformers may learn, that however pure their intentions, the whole forms of governments and the habits of men should never, however vicious and defective, be violently overturned; much less all existing laws at once annihilated, and the many-headed multitude called upon to support the change. When men's minds are totally unhinged, they will always be carried to extremes more dangerous and more inimical to public felicity than were the abuses, however flagrant, meant to be reformed: nor will the moderate or well meaning ever be able to guide or stem the torrent. Whilst the sober citizen waits with unavailing patience the promised good, the profligate and the desperate will be active, and their designing leaders will mount the storm and direct it to their purpose. No vices of the state are so inveterate as not to be cured by temperate and lenient measures. Convulsions, if they last beyond a moment, tear up the virtues with them.

Should the Almighty, in his mercy, avert calamities and ruin similar to those which have overtaken France, and restore peace and tranquillity to it and to Europe, the consequent debility of that still rival country, which half a century could scarcely recruit, will secure Great Britain for some time from its enterprises. May she in that interval of quiet sedulously attend to the gradual alleviation of that load of debt which presses so heavily on every source of prosperity! The wars in which it has been incurred have been as frequently excited by popular clamour and the interested views of monopolizing commerce,

commerce, as by the ambition of courts. If to force that commerce beyond its natural bounds, which are those that industry can fairly gain, or under the pretence of balancing the powers of Europe, sufficiently able, during this second infancy of France, to counterpoise each other, she engages in wars which must be unnecessary, she will undoubtedly bring upon her head a ruin as complete, and much less remediable from inherent resources, than that which has overwhelmed her neighbour. When relieved from those oppressive taxes which cramp her industry and her commerce, let her hold up to all mankind that confraternity and intercourse of benefits, which the providence of Heaven, allotting to each clime peculiar productions, and to each nation peculiar genius and habits of industry, certainly intended. Let her propose to every nation treaties of commerce on that equitable plan sketched out, but not perfected, in her late treaty with France. In these let all her colonies, no longer a forced and unjustifiable monopoly, be included. Why should they, under reasonable restrictions, be secluded from general intercourse and a participation of the wide-spread blessings of the Creator? Freedom of commerce, subject to such imposts only as are due for protection, is the undoubted right of all mankind. The loss of America should teach us this eternal truth, and supported by that continent the islands will one day claim it. Such freedom of commerce would only serve to increase rapidly the value and industry of those colonies; but, as that consummate politician Mr. Smith observes, the monopolizing spirit of trade is ever militating against the national as well as general good. The devastation of the most important colony of France affords an opportunity of effecting this just reform, without even exciting the cries of jealousy from a supposed advantage to our neighbours. With them it will probably be a necessary measure. From a final conviction of the soundness of that policy, should Spain also be induced to relax, the first advantage would be to the most active and industrious people having the greatest capital in commerce, and consequently, in the present situation of Europe, to Great Britain.

The slave trade and the slave laws in the West India islands, under what-

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ever pretext attempted to be justified, are certainly in their present form immoral, inhuman, and unchristian. What has happened in the French islands, and even now threatens our own, shews that their continuance is a mine big with destruction, a naked sword hanging by a thread over the heads of the proprietors. General and sudden emancipation is on all hands allowed to be a measure equally impolitic for the slaves themselves as for their owners. The severer fate which might have awaited many of those who are thus carried into distant captivity may, if strictly and generally true, perhaps excuse the continuance of the trade, and the necessities of the colonies render the total prohibition of it inexpedient in the eyes of the politician; but there are regulations long adopted in several Spanish colonies, which would go far to justify the practice, and, by restoring a considerable portion of happiness to those men of misery, would train them by gentle means to industry, and in return make their labours much more beneficial to their purchasers. By these, in the first place, the great principles of Christianity are taught to all, and in consequence the Sabbath day is religiously dedicated to that great purpose, and to relaxation from labour. Over and above this day of rest, each slave is entitled to one day in the week, on which his labour is for his own emolument, and he is free to hire himself either to his own or any other master. When by his industry on this day he has amassed a sufficient sum, he is entitled to purchase at a fixed price the freedom of a second day, and so on successively till he is totally emancipated. There can be little doubt but that by similar regulations, at least for all who should be hereafter imported into our colonies, the rigours of slavery would be gradually softened, and that real happiness may ultimately result to those who shall hereafter exchange despotism, slavery or death in their own country, for a truly milder fate in a christian one. To extend the blessing, let all born in slavery be entitled to the same privilege at the age of 21; and let this great nation generously purchase one day of freedom for all adults. Under such a system, strengthened by a revised code of slave laws, which should no longer look upon negroes as below the human species, the planters, laying aside the degrading whip, would no longer sleep in the

the constant dread of the insurrections and conspiracies of deep revenge; they would in a very short time find their real interests not impaired, but promoted, by willing industry excited by those hopes which are dearest to the heart of man. Such regulations would, in my opinion, solve the question which has so long agitated the nation, and reconcile humanity with private and general interests.

There is yet, besides the pressure of taxes and some partial evils and abuses, one seed of discontent, and of even possible dissolution of the whole frame of government, still unremoved in these kingdoms. The cure of those must necessarily be the work of time and gradual reformation: this may be pulled up at once.

The mild religion of Christ never certainly authorised persecution in any shape, and the church of England has always claimed toleration as its peculiar boast; but yet its practice, like that of all other predominant churches, has been far from conformable to this golden rule. As Mr. Paley ingeniously observes, the anxiety of preserving power once acquired has ever found various pretexts to gloss over the practice of persecution disavowed in principle. The pretended necessary alliance between the established church and the glorious constitution of these realms, and the preservation of both, have hitherto been successfully held up as a full justification of penal laws against all dissenters from the creed of the former. Those against Roman catholics were in some cases sanguinary, in others highly immoral, provoking and authorising legal robbery, exciting not only dissensions, but the blackest perfidy and ingratitude amongst the nearest kindred. To the immortal honour of Englishmen, the moral sense of the people has seldom suffered them to be carried into strict execution in this kingdom. In Ireland, the rapacity of needy adventurers sent thither to despoil instead of civilizing or conciliating the natives, and the alarms of their descendants, suffered them not to sleep. Rebellions and insurrections, excited by wrongs and severities not to be tamely borne by human nature, caused their strict execution to be looked upon till very lately without horror or disgust.

These foul stains, which for more than 200 years have shamed the laws of a free people, have happily at length been done away; but incapacities of every kind still continue not only to vilify, but to deprive of the noblest rights of Britons, those of that persuasion not only in Britain but in Ireland, where they constitute a very great majority of the nation. In that sister kingdom, the long operation of oppressive and degrading penal laws has reduced the numerous catholic peasantry not only to an indigence, but to a state of abject subjection unknown even to the boors of Russia or Poland. By their hard task-masters they were looked upon as an incumbrance they reluctantly suffered to exist*. Sound policy had at last suggested, in times when mobs were industriously taught that they alone were sovereigns, that the abolition of all those remaining penal statutes, which stigmatized two thirds of the nation as aliens to the constitution, was not only expedient, but perhaps necessary to the salvation of the empire. Unfortunately the revived apprehensions of the ruling parties, both in church and state, of losing any portion of long monopolised power and riches, dashed from the lips of that insulted people the hopes officially held out of speedy emancipation. It was urged that sufficient, perhaps more than sufficient, indulgence had already been shewn; that the catholics were re-admitted to the protection of the laws; that even the right of election had been restored to them: and it was insinuated, that the capacity of sitting in the legislative body, or of holding the higher civil or military offices, could be of little moment to the great body of that people, whose indigence of course excluded them. Insult was thus added to injustice. One of the greatest blessings of our happy constitution is, that there is no man, however low his station, who may not hope by industry and merit to raise himself to the highest situations. By any whatever legal incapacities, not only he, but his latest posterity, is cut off from every hope of rising to a par with other subjects. So much for the justice

* An English gentleman, riding with an Irish proprietor, was admiring the beauty of the country; "O yes," replied his conductor, "if it was but peopled." "I seldom saw a more populous one." "'Tis true, there wants not men, but they are papists."—See Mr. Crumpe's account of the treatment of the Irish peasantry, in his essay on the best means of providing employment for the people.

of this proposition : let us now consider it in a political light. The monopoly of riches in any hands can never contribute to the prosperity of a nation. It is the affluence and industry of the lower classes which can alone make it great. Extreme indigence has made the poor Irish catholics idle and profligate, and thence lawless, and dangerous to all social order : they have no concern in the public weal. Surely sound policy requires that every incitement be held out to rouse them from a state so immediately detrimental, so threatening to the very existence of society. Dragooning may awe them for a time, but it cannot last ; and if it could, is this a means of ruling British subjects ?

True christianity blushed to hear both in senates and in private conversations, persons of otherwise mild and candid dispositions assert, that a restoration of all the privileges of British subjects would be repugnant to his majesty's coronation oath—as if the king could have taken an oath to withhold his consent to the abrogation of persecution. But the deprivation of the dearest rights of Britons, for the preservation of which every Briton would shed his blood, was maintained to be no persecution, but a measure of safety to government and to the established church. The state has a right to adopt a religion, and to confer on it exclusively the honours and possessions assigned to public worship ; but though it may have the power, it has no just right to force it by civil incapacities upon its subjects. Such incapacities are real punishments and notes of infamy, if infamy was within its jurisdiction, which justice forbids it to inflict except on crimes against the state, good order, and the general morality of all religions. Let the church guard, by whatever tests it may judge proper, its sufficiently great advantages against the intrusion of false or hostile pastors ; but let it not pretend that civil employments are incompatible with nonconformity to its peculiar doctrines. This is clearly persecution on religion's account. Particulars may deserve but have no claim to offices of trust ; government will always have a right to confer its confidence on such persons only as it shall deem worthy of it ; but neither church nor state can have a just right

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to exclude indiscriminately whole bodies of men, and with them their posterity, from the common liberties, privileges, and advantages of the community of which they form a part, and to the general prosperity of which they equally contribute their industry and fortunes. If the doctrines held by the Roman catholics are not repugnant to the constitution, or to the established government of the country, they have a natural and indefeasible right to all its privileges without exception. The strong hand of power may withhold their claim, but eternal justice will maintain it undiminished.

With whatever patience the catholics of Ireland have been, or may be yet endued, it is an absurdity in politics to suppose that a third, and, if the members of the established church are alone counted, not a seventh part of the inhabitants of a country should for ever hold its undivided, its exclusive rule. Protracted delusive hopes held out can only irritate the feelings of injured men: pray Heaven they may not at length be roused to phrensy! Let the loss of America warn the rulers of this nation not to extend powers, which reason will not justify, beyond the term which circumstances prescribe.

In Great Britain, the numerous protestant dissenters of every denomination have a no less equally just claim to unlimited, unrestricted toleration. That the members of the legally established church in one part of the kingdom should not be entitled to serve their own country in a military line, without being subjected to prosecution for not having outwardly conformed to rites repugnant to its tenets, is a manifest absurdity, which an annual indemnity act only makes more glaring. It is alleged that one sect of these dissenters is even from religious principles not only inimical to the established church, but to monarchy and the present constitution. Some of these may be really enemies to them, but certainly not all. Already admitted into both houses of parliament, enjoying many high offices, and filling many corporations throughout England, and thereby possessed of great power and influence, will not partial restrictions naturally make those who
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are already so inclined still more hostile, and use every effort to overturn that government which excludes them from any part of their common rights? To many other sectaries no principles adverse to government can be objected, and they can only imbibe such from a sense of grievances under it. Their common persecution, for such it is, alone binds all these otherwise heterogeneous parties into one formidable mass of justly dissatisfied men. Can government and the constitution for ever remain secure with such a leaven, fermenting in so large a portion of its subjects? Restore to all their unrestricted rights, and all union is dissolved. Even the most hostile part will be no longer formidable. Having no longer cause of real complaint, they will be deserted not only by other sectaries, but by the sounder part of their own brethren. True policy then, no less than justice, demands that in this free country every man, whatever be his religious persuasion, should enjoy in their fullest extent all its rights. Crimes against society and the laws should alone exclude. Whoever believes in a religion, in so much as he is actuated by his creed is a friend to virtue.

May grievances, however real, yet easily removed, serve not ambition to undermine a constitution as yet the noblest boast of human wisdom, and hurl down on these realms a ruin equal to that which has overtaken our unhappy neighbours! Extended conquests, and exuberant riches with their attendant vices, have been from the beginning of time the bane of every state. Impartial justice and protection on the part of governors, union and content amongst the governed, can alone secure the prosperity of nations, strengthen and perpetuate empires.

I have perhaps, in this protracted note, swerved from my subject. But reflections on the greatest interests of mankind can never be totally misplaced; and those on a transaction which stands single on the annals of mankind, and the observations it gives rise to, come naturally within the investigation of the first causes of calamities brought upon man by the contention of human passions.

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It appears by authentic documents, that the number of males subject in Russia to capitation, exclusive of the conquered provinces, and of Siberia and countries north and east of this last, amounted to 10,112,182 in the year 1763, and that it had arisen in 1783 to 12,428,488; an increase of more than one fifth in the space of 20 years. In that space indeed no inconsiderable number of Greeks had transmigrated from Turkey into its southern provinces. In more fertile countries, and at a time when the age of man was still double to its present stretch, in the end of the period between the dispersion and the vocation of Abraham, and in the beginning more than quadruple, we may surely without danger of excess take this proportion of increase as a standard, notwithstanding the numerous accidents of emigration in the midst of the yet frequent convulsions of nature to which these first settlers might be exposed. From the 700,000 souls, whom we have supposed to have settled at the dispersion in all western Asia, this increase of one fifth in the space of every 20 years will give us more than 10,770,639 in the 300th year after the dispersion. Seventy sons and grandsons of Jacob had indeed increased much faster in Egypt; but that was owing to a peculiar blessing and dispensation of Providence, and cannot be alleged as any ordinary rule. At the end of 215 years the number of men capable of bearing arms is reckoned 600,000, and consequently the whole number of souls must have been at least 1,800,000. In those days of polygamy the whole families of these Israelites settling in Egypt, including wives and daughters, must have probably amounted to 210; from these we must double the population every 17th year, to give us 1,976,000 in the 211th year after their first establishment. For 80 years before the exodus great severities and the destruction of male children had been exercised upon them, so that there might probably remain as above, about 1,800,000, to leave the country.

(oo) Page 72.

Considering the yet great longevity of men in the ages immediately succeeding the deluge, I think I have shewn that the rise of population from

700,000

700,000 to 10,770,639 in the space of 317 years cannot be deemed an extravagant supposition. But should we add 300 years more to the space between the dispersion and the call of Abraham, we cannot well compute a smaller number than the one above mentioned to have existed in the whole of western Asia at the end of that period. Should we retard the increase of population after the first 300 years on account of the decreasing age of man, and the possibly increasing difficulties of subsistence, by supposing thirty years instead of twenty necessary to make an addition of one fifth to it; even that slackened progression, surely justifiable in the yet happy circumstances of mankind in a fertile and prolific country, would raise the numbers at the end of 617 years to 58,028,970: a total by no means consonant to the appearance of population in the days of Abraham, but very suitable to the state of those countries as depicted to us in the time of Moses.

(ppp) Page 73.

Eighty years before the Israelites left Egypt, the king of that country gave for reason of the cruelties he was about to inflict upon them, that they were so increased as to equal, if not surpass, the number of native Egyptians. Their numbers at the exodus were, as we have already seen, about 1,800,000. Supposing their numbers in proportion to the Egyptians to have been exaggerated by jealousy, and that their increase was greatly retarded by these cruelties, we can yet scarce allow more than three millions to the Egyptians. These will not form a very considerable or formidable nation. We shall be told, perhaps, that that country contains not a greater number at present, since Mr. Volney asserts that it has not at this day more than 2,500,000 inhabitants. But we know to what degree its fertility and its population are degraded by the long tyranny of the Mamelucs and Turks. That country no more resembles antient Egypt in the times of Nechao or of the Ptolemies, than Syria, Palestine, Babylonia or Assyria, in their present state, retrace the memory of those potent kingdoms where Antioch, Jerusalem, Babylon or Nineveh flourished in the days of their glory.

(qqq) Page 75.

So late as the year 1412, on occasion of an intercourse of embassies and letters between Shahbrokh, fourth son of Timur Khan Sultan of Chorasān, and Day-ming the third prince of the dynasty of Ming, this last is called emperor of Chin and Mâchin. See Dissertations relating to the History and Antiquities of Asia.

(qqq) Page 86.

Archbishop Usher, and with him Dr. Blair, bring down the vocation of Abraham, and with it all the other events of sacred history to the exodus inclusively, 60 years later. But it is evident that the Hebrew chronology which they adopt, reckons no more than 367 years between the deluge and the vocation of Abraham, which places it in the year 1981 before Christ.

(rrr) Page 87.

Sir Isaac Newton places Mephres in 1125, seemingly that the first expulsion of the shepherds under his son may strengthen the Philistines who take the ark in 1100. But those Philistines had more than once been troublesome to the Israelites before that time. My reason for placing him so much earlier is, that the reign of his son and the expulsion of the shepherds may coincide with Herodotus, who asserts that Egypt was possessed by shepherd nations during 511 years. Herodotus relates the Egyptian fables as such; but where he gives us, as in this place, his own opinion, he merits all credit as the surest guide through the intricacies of history.

(sss) Page 88.

It was, I apprehend, during these 296 years which followed the retreat of the Israelites, that Egypt was split into several sovereignties. The loss of a great army, of the king and of his eldest son in that event, afforded a very probable opportunity to ambitious chiefs to set up for themselves at Coptos, Thebes, This and Elephantis. In this debilitated state of the country, the nations, driven out of Palestine by Moses and Joshua, easily possessed

possessed themselves of the nearer and more northern parts, and finally erected independent kingdoms at Abaris, Sais, and Memphis, and by degrees extended their dominion into Upper Egypt, till at last checked by Mephres, and confined to Abaris by his son. During these 296 years about 14 kings might reign in each of these separate kingdoms, of whom the Egyptians have made more than 100 reigning successively over all Egypt. It is perhaps worthy of observation, that the tables of Manetho present a remarkable degree of confusion and absurdity in the 13th, 14th, 15th, 16th, and 17th dynasties, preceding that wherein Mephres and his successors are found. From a wish to cover these, great variations are no less observable in his transcribers Africanus and Eusebius. In the 13th dynasty we find 60 kings reigning 184 years, not much more than three years each, according to Africanus: the time is extended to 453 years by Eusebius, but still in such a long succession allows not eight years for each reign. In the former the 14th dynasty is wanting; but in the latter 76 Xoite kings reign according to some copies only 184 years, and to others 484. In the one, six Phœnician shepherds fill a space of 284 years, and in the other, Diospolite kings reign 250 years in the 15th dynasty. In Africanus 32 Greek shepherds reign 518 years in the 16th, whilst in Eusebius five Thebans reign 190 years. By the former the 17th dynasty is filled by 43 pastor and as many Theban monarchs, reigning only 153 years; in the latter by four Phœnician shepherds during 106 years. It must indeed be confessed, that the same absurdities and the like disagreement between the transcribers obtain in many dynasties previous to these, particularly in the 4th, 5th, 7th, 8th and 9th dynasties. One flagrant proof, of placing successively contemporary kings, occurs in these tables, which I do not remember to have seen noticed, though sufficiently obvious. In the 27th dynasty the kings of Persia, from Cambyfes to Darius, are regularly entered. The Egyptians, particularly averse to the Persian government, frequently revolted during that time, and were as frequently reduced. The 28th, 29th, and 30th dynasties consist of those princes who either attempted, or for a time

succeeded in throwing off the yoke, and are thus placed in succession, though living during the identical period taken up by the 27th Persian dynasty.

(*ttt*) Page 88.

Herodotus informs us, that before the capture of Sardis, 544 years before Christ, Cræsus and his predecessors Alyattes, Sadyattes, Ardys and Gyges, had reigned over Lydia 170 years; and that a family descended from Agron, grandson of Belus, who was sprung from Hercules, of whom the last was Candaules, had swayed its sceptre 505 years after the extinction of the race of Lydus. This places that epoch of the monarchy in the year 1219 before the Christian æra; and in the usual course of nature Belus, whom he calls a descendant of Hercules, in about 1270, and consequently about the time or sooner than the Grecian Hercules is said even by the Grecian chronology to have flourished. We have already proved that this hero really lived about two centuries later. It was not therefore from the son of Alcæus that the Assyrian monarch was descended, but it was from some more antient hero or god of that name from whom he claimed his origin.

(*uuu*) Page 89.

We have already seen that the sovereigns of Assyria had given a king to Lydia, though it continued to remain independent. The same Herodotus dates their dominion over other parts of Upper Asia beyond the bounds of Assyria in 1206. According to him, Astyages, from the time of his overthrow by Cyrus in the year 536, and his predecessors Cyaxares, Phaortes, and Dejoces, who revolted from Assyria, had reigned in Media 150 years. He assures us that the Assyrians had held the dominion in Upper Asia 520 years before that revolt; from whence I conclude that the first great extension of that monarchy is to be dated in 1206.

(*xxx*) Page 89.

Priam was the sixth successor of Dardanus; and as his reign was long, I have

have thought proper to allow in so short a succession 30 years to each reign, one with another.

(yyy) Page 90.

I cannot think with Sir Isaac Newton, that this Ammenemes, Amenophis, or Ammon, was the original Jupiter Ammon of Egypt; or that the gods or deified men of that country were of the same recent date with those of Greece; or that Thebes was called Ammon-no, or part of Libya Ammonia, from the father of Sesostris. Ham was the original Jupiter of both countries. That king's flatterers, or those of his son, might indeed assimilate him to, or identify him with, that more antient founder and god of Egypt; we see it attempted much later by Alexander and his courtiers. Herodotus tells us that the Greeks, in adopting the gods of Egypt, had transferred to heroes of their own, of recent date, the titles of divinities adored from time immemorial in Egypt; and this adoption happened in times nearly coinciding with the reign of this monarch. The name of Ammenemes or Amenophis frequently occurs in the lists of Egyptian kings, who, like those of Assyria, often assumed titles compounded from those of their first deities. This is evidently compounded from Ammon or Ham and Menes or Menoph, the same as Mizraim, in the same manner as, amongst others, that of Assaraddon in Assyria was certainly composed of the names of their gods Assur and Addon. He certainly did not found, but he might beautify and strengthen, Thebes in Upper Egypt, as some of his successors adorned Memphis or Mefr, capital of Middle Egypt, which after the fall of Thebes became that of the whole kingdom. Possibly too this latter city might at the same time have been removed nearer to the Delta. Though Grand Cairo has more than once changed sites, it has, wherever situated, been called Mefr by the Cophts.

(xxx) Page 90.

Herodotus tells us that in the reign of Atys, son of Manes one of the monarchs.

monarchs of Lydia of the race of Argon, the Lydians, in consequence of a long continued famine, agreed to send out considerable colonies in order to exonerate the country. Tyrrhenus was the chief of one of these. He says they first sought settlements in several of the Grecian islands, but that Tyrrhenus and his followers finally fixed in Umbria. To this transaction he assigns no date; but I think it very probable that at this time the son of Alcæus, assuming the name of Hercules, first came into Crete, and thence passed into Greece. I have therefore affixed to it the date of his appearance in these countries, as deduced from other events in which that hero was an actor.

(aaaa) Page 91.

To corroborate the opinion of Sir Isaac Newton, that Sesostris is no other than the Sefac of scripture, we will observe that the list of kings given by Herodotus, from Sesostris to Sethon, in the beginning of whose reign he fixes the flight of Sennacherib the Assyrian king, which happened anno 714, will in the course of nature fix the reign of Sesostris about the time of Sefac. His succession runs thus: Sesostris was succeeded by his son Pheron, after whom an elected king, called by the Greeks Proteus, to whom succeed Rhampsinitus, Cheops, Chephrenes, Mycerinus Afychis, Sabacon and Anyfis, living at the same time, after whom Sethon was chosen king. Sesostris reigned 46 years, after whom reign eight kings to Sethon. As Sabacon and Anyfis together reign above 50 years, and as Cheops and Cephrenes, brothers, are also said to have ruled Egypt during a very long time, though the duration given to them by the Egyptians, if brothers, exceeds all possibility, we may safely give to these eight reigns 30 years each, which will bring the commencement of that of Sesostris to the year before Christ 1000, nearly the date of Sefac as deduced from holy writ. To coincide with his date of the Argonautic expedition, Sir Isaac Newton supposes Danaus to have fled into Greece towards the end of that monarch's reign. But I think it full as likely that, Sesostris being absent in Libya at the time of the death of Amenophis, that prince might have then taken occasion to usurp his brother's throne, and was on his return expelled from Egypt.

Egypt. Accordingly, in the dynasties of Manetho, as well as in the list of Syncellus, we find Armes or Armais, called Danaus by the Greeks, reigning before his brother Sethos Egyptus, the same as Sefac and Sesostris.

(bbbb) Page 91.

This was not peculiar to Attica ; a similar change took place in most of the states of Greece, in Argolis, Lacedemonia, &c. The Phœnicians and Egyptians who settled in Greece first taught the former wild inhabitants to build houses ; and these, situated for safety pretty near each other, became villages, and in time towns, each having its council and prytaneum, though confederated with a certain number of others, all acknowledging one chief or king. In all these, about the same period, these separate prytanea were united in one town, which thence became the capital and seat of government of the whole state. The different quarters of the metropolis, as at Sparta, generally retained the names of the smaller tribes or towns. In Arcadia and Thessaly, as well as in some other states of this country, each town and district continued independent as to internal government, and only at stated times sent deputies to a general confederation whose meetings were held at one of them. Less adapted to ambition, these states acquired less renown in story, but were longer exempt from the vicissitudes of fortune. On the death of Codrus monarchy was abolished at Athens ; and about the same time, excepting at Sparta, where the title, with very limited authority, was conferred on two families, the very name of king was condemned in all Greece. Macedonia alone retained its monarchy, which seems to have been absolute. To it all these long flourishing, but ever jarring, republics were finally forced to submit. In order to undermine that empire, the policy of Rome for a time revived the spirit of liberty ; but, that effected, Greece only changed its yoke, and sunk into Roman provinces. The rapacity of proconsuls stripped it of its most precious ornaments of art, and its philosophers became the subservient tutors, and often slaves, of Roman citizens. Their sophistry soon corrupted the principles and morals of antient Rome, and an ineffectual law attempted, when too late, to banish them, from.

from the republic. Such will ever be the effects of that pernicious mode of reasoning into systematical doubt.

(cccc) Page 91.

I need not here repeat what I have already said on the most probable date of these two famous eras of Greece, the Argonautic expedition and the siege of Troy, by which all the former events of that country and the corresponding ones of Egypt must be fixed. I think I have shewn the strongest grounds for dating them as above, within a few years more or less.

(dddd) Page 92.

Egyptian vanity and Manetho's dynasties, were they really successive, remove the building of these famous monuments to much higher antiquity, and to at least 1000 years earlier; but Herodotus fixes the foundation of the first great pyramid to nearly this date. They certainly did not exist when Homer travelled into Egypt, but might have been begun soon after.

(eeee) Page 92.

It is clear, both from the historical and prophetic parts of scripture, that Syria and Babylonia were independent of Assyria to the time of Pul. Its monarchy began with Assur the founder of Nineveh. Herodotus has pointed out the æra of its first extension, but it is from Pul only we can date its growth into a great and mighty empire.

(ffff) Page 93.

n Sir Isaac Newton in his chronology places Semiramis in 760, making her contemporary with Pul. But that proud conqueror does not seem to me likely to have shared with her his empire and his glory. She was more probably the widow of his youngest son Nabonassar, who succeeded him at Babylon; and in this opinion Sir Isaac himself seems to coincide in his historical account. During the minority of her son she may have assumed the reins of government; as Nitocris, a queen no less famous for the execution
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tion of stupendous works at Babylon, afterwards did during the infancy of her son Labynitus. Allowing 30 years for each succession upwards, from the taking of Babylon, the age of Semiramis will be with probability fixed as above.

(gggg) Page 93.

Sir Isaac Newton places this revolt in 711, to make room, I suppose, for a fifth king of Media before Cyrus. But Herodotus positively restricts its kings to four, enumerating the years of each reign, making in all 150 from hence to the close of the Median dominion. Sir Isaac also accuses this historian of inverting the order of succession in Media, by making Cyaxares the father instead of the son of Astyages, in consequence of which he adds another king Darius the Mede son of Cyaxares. I must own I do not see sufficient reason for this, but am apt to believe that Astyages was the last king of Media (in which Herodotus is supported by Pausanias), and that he is the same prince called in scripture Darius the Mede. Sir Isaac's chief reason for removing this prince's reign beyond those events which put an end to the power of Lydia and Babylon, seems to be, that he is said to be of small abilities. But all those conquests were achieved by the superior conduct of his Persian general Cyrus, who soon disdained to be second to a weak monarch, and in two years by his overthrow transferred the empire to Persia.

(hhhh) Page 93.

The Roman historians suppose the seven kings of Rome to have reigned 244 years; a length of time which Sir Isaac Newton justly thinks improbable, considering that several of these princes were slain, and that the last lived many years after his expulsion. He reduces these reigns to 17 years each; which, considering that the reigns of two are allowed to have been long, I think too little. I have therefore allowed 23 years to each reign.

(iiii) Page 93.

Sir Isaac Newton places this invasion of the Scythians in 635, in the reign

of Darius

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of Aftyages, whom he supposes the father of Cyaxares, and grandfather of Darius the Mede ; but Herodotus positively asserts that it took place in the beginning of the reign of Cyaxares, which he allows to have been in 611. The absence of that monarch in the conquest of Nineveh, and in settling that new acquisition, seems to afford a probable opportunity for such an irruption into Media drained of troops for that expedition.

THOUGHTS

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER II.

Analysis and Refutation of Mr. Bailly's first System of the Origin of Nations, and all Population derived from the Poles, deduced from antient Annals.

IN my last letter I have shewn you, Sir, the most authentic monuments of history concurring with general tradition, and the relation of the Jewish legislator, the first known historian, to establish the reality of an universal deluge. The result of the comparison, and of an estimation certainly not partial, of antient chronologies fixes that event to an epoch which cannot be removed beyond 3500 years before the Christian æra. Strong indications and testi-

monies of much greater weight than those chronologies concur to prove that this date presented by Mr. Bailly in his last work as the most probable, is yet too high by several centuries. But I ought not to pass under silence a prior system of this same author better adapted to the generality of readers, and of course better known, of which I have hitherto had occasion to speak only in a cursory manner. Though his last work seems amply to contradict and invalidate his first pretensions, yet whatever has fallen from so celebrated a pen certainly deserves to be considered in the discussion which I have undertaken. Shortly after the publication of the famous epochs of nature by Mr. de Buffon, Mr. Bailly, who both by the fire of genius and by seducing eloquence was well calculated to be the disciple and emulator of that celebrated naturalist, undertook to support his system by the testimony of history. Notwithstanding the pretended certificates of nature herself, invoked by the former with all the authority of an infallible interpreter, he felt how much the direct contrary depositions of history might invalidate those assertions, if these could not be conciliated with, or reduced to be at least somewhat less unfavourable to, the system. In this essay, those same antique traditions to which I have ventured to appeal as proofs of that great revolution operated by the deluge being of no very high antiquity, seem under his ingenious pen to concur in throwing it not only beyond all existing annals, but beyond all calculable date. They will, according to him, confirm that constant and imperceptibly slow refrigeration of the earth, and that first residence of man under the

poles in times far antecedent to all history, and even to the establishment of all nations now known, contended for by his master; they would in fact exclude, though not an antient prevalence of waters upon the earth, yet such a general deluge as is generally understood. It is clear, that according to Mr. de Buffon the reign of waters must have preceded the birth of man several thousand years, and that since that epoch they never could have covered the entire earth. If Mr. Bailly does not openly deny a deluge posterior to the existence of the human race, which he cannot but own a prominent feature in all these traditions, he sufficiently insinuates that it is only to be understood of the inundation of an island the first dwelling of men; or even that this so general idea arose only (the ice having in length of time intercepted all communication with it) from the supposition of those men who had already settled on the continent, that it was really lost and sunk in the waters. I shall not dissemble, Sir, that I have some reason to dread a contest with such an antagonist, combating with my own arms in support of a system which, in your country in particular, and in all countries amongst those who think it a mark of wisdom to reject all antient opinions under the name of old prejudices, has received so much weight from the authority and imposing eloquence of the French Pliny; but I trust in the goodness of my cause. I hope to prove from Mr. Bailly himself, that all that I have advanced in my first letter is strictly conformable to the only true and natural sense of those passages in antient authors, which we have both quoted; and notwithstanding the
opinions

opinions of several modern naturalists, I hope hereafter to demonstrate, that my thesis is neither weakened nor contradicted by the real physical monuments of nature.

Mr. Bailly, in his enquiries into the state of antient astronomy, had observed that several antient nations, as the Egyptians, Chaldeans, Indians and Chinese, though seated at great distances from each other, possessed several astronomical formulæ common to them all. He also found several learned periods equally established amongst them, and particularly that of six hundred years, which he also remarked to be in use amongst the Tartars, amongst whom he supposes a still more profound knowledge of astronomy than was even possessed by any of these other nations. It appeared also, that all these people employed these rules and formulæ in the same manner as several of our workmen make use of certain mechanical or geometrical rules without any knowledge of the principles on which they are founded. For so many ages the learning of all these nations has been stationary in this respect; they neither invented nor divided further; they only traditionally preserved what had been handed down to them. From thence Mr. Bailly concludes that these people were not inventors of this science, but simply and blindly followed what they had learnt from some more antient and more learned nation. The conclusion seems perfectly just; and Mr. Bailly, with all the ardour natural to him, set himself to search into the archives of antiquity, to find the traces of this learned antient nation, first in-

structor

structor of all others, whose memory seemed to him to be lost. Plato furnishes him with the first intelligence of it. That philosopher, from the traditions of the Egyptian priests, speaks of an island sunk in the sea, and of a lost people, which he calls Atlantis and Atlantides. Mr. Bailly seizes this idea with that enthusiasm which belongs to heated genius, and pursues it with that rare ingenuity which he had received from nature. He seeks the origin and follows all the footsteps of this pretended nation with incredible zeal. By the help of great erudition he opens to himself a road through surrounding difficulties, which, by the charms of style, and a thousand ingenious remarks, he has every where strewed with the most agreeable flowers. An analysis must necessarily be dry; let us however try, through all this erudition and these flowers of eloquence, to follow closely the thread of this new labyrinth. However less agreeable, in order to form a right judgment, it will not be improper to follow his reasonings stripped of all those adventitious ornaments with which he has environed them. We shall see confirmed many of those traditions which I have already occasionally cited with several others which I had not mentioned: this will make this extract rather long; but it is necessary to examine those first sources from which we have both of us drawn.

According to Plato, a learned priest of Egypt informed Solon, that in the temples of Sais in Lower Egypt were preserved the records of 8000 years since the deluge, and that 9000 had elapsed
from:

from Uranus to that disaster. He told him that, the gods having divided the earth amongst them, the island Atlantis fell to the lot of Neptune. The god found in it one single man Evenor, and his wife Leucippe sprang from the earth. He married their only daughter Clito, of whom he had ten sons. He divided his dominion into ten parts amongst his ten children, of whom Atlas was the eldest, and gave his name to the island. He and his posterity reigned with glory in this country of delights, whose plenty and riches were never equalled. Its inhabitants were wise and virtuous, and were governed each in his district by Atlas and his nine brothers. These ten chiefs assembled every five and six years alternately, to deliberate on general concerns, and to sacrifice to the gods. But this purity of manners of the first Atlantides continued not long; they became corrupted, and Jupiter resolved to exterminate them. The Egyptian priest added, that these islanders, proud of their power, after having subdued Libya and all Europe as far as Tyrrhenia, attempted the conquest of Egypt and Greece (*a*); that the Athenians alone resisted, and at length triumphed over them; but that in later days there happened earthquakes and great inundations of water, which in one day and night swallowed up all the Grecian warriors, whilst at the same time the island of Atlantis disappeared in the sea. This island was situated beyond the columns of Hercules, in the western ocean, and was larger than Libya and Asia together.

Diodor

Diodorus of Sicily tells us that the Atlantides inhabited a maritime country in which the gods were born. Uranus son of the heavens was their first king. Amongst his children were Hyperion, Atlas, and Saturn. The virtuous Hyperion was assassinated by these two brothers. After his death the children of Uranus divided his empire amongst them. The most renowned of these were Atlas and Saturn. The maritime countries became the lot of Atlas, who had a virtuous son called Hesperus, who was taken up into the air by the winds, and never more seen. Maia one of his daughters had, by Jupiter, a son called Mercury inventor of letters. The rest of the Atlantides had also illustrious sons. Some of these built cities, and others were the fathers of nations. The reign of Saturn was the golden age, and Justice was born under him. He resigned his kingdom to Jupiter ; but he soon after leagued with the Titans and giants, fierce sons of the earth, to dethrone Jupiter, who remained conqueror. Diodorus connects the history of these gods with that of Egypt.

Sanconiatho (*b*), a Phrygian historian, who is supposed to have lived before the Trojan war, and to have drawn his accounts from the books of Thot the father of history, preserved in the temples of Tyr and Biblos, begins his with the origin of the world formed from Chaos. As yet there existed nothing, says he, but the breath and spirit of a dark air, a chaos full of confusion and without light. This spirit falling in love with Chaos produced Love, and thence mud,

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whence all beings proceed. Matter becoming suddenly enlightened, the sun and all the stars appeared ; the earth and the sea became inflamed, and from these came the winds, clouds, and rain. The mixture of all these things produced lightnings and thunder. At this noise the animals, as awakened from a profound sleep, began to move upon the earth. From night and wind were born the first mortal man and woman, authors of mankind. He afterwards gives an account of the first races of men, and reckons ten generations to the deluge. Uranus, Chronos or Saturn, Thaut or Mercury, Atlas and Jupiter, were of this number ; one of the sons of Uranus is killed by his brother ; Mercury invents letters. He speaks not, it is true, of the Atlantic nation, because he attributes all these heroes to Phrygia.

In despite of Plato, who fixes the Atlantides in an island beyond the streights which Hercules opened, notwithstanding Mount Atlas, and the ocean which bears their name, and the conquest of Libya in their neighbourhood, Mr. Bailly not finding any traces of this learned and conquering people in burning Africa, and according to his system then too burning to be habitable, transports them suddenly into the midst of the continent to the foot of Mount Caucasus. Hercules was not less known in Asia ; two columns were dedicated to him in his temple at Tyr. The Sun, sometimes figured by that god, by Apollo, Adonis or Osiris, was adored throughout all Asia. His worship is even derived from Scythia : the proof is at hand. In the adoration paid to the Sun, to Apollo or Osiris, their death or their absence

absence was deplored during 40 days in Egypt, and during six months in Phoenicia. This must be an institution of northern countries, in which, according to latitudes, the absence of the sun was regretted for these periods. Atlas and Hercules were known to the Hyperboreans, and from them their gods as well as those of more southern nations are descended. Apollo hid his arrows behind the Hyperborean mountains, Prometheus is chained to Caucasus. From all this Mr. Bailly thinks himself entitled to abandon the Atlantic ocean, a name which he observes the ancients bestowed equally on the red and frozen seas, to place his chosen people in the north.

Not content with transporting the Atlantides beyond Phoenicia and to the foot of Caucasus, Mr. Bailly soon contrives to overleap these mounds, and, under another name, will find means to settle the Atlantides beyond them. In Persia too are found the traces of a nation prior to all others. The Persees, descendants of that ancient people, as yet preserve their antique traditions, of which the following is a summary :

Before the formation of Adam God created the Dives. These were giants, who reigned 7000 years. They became wicked, and were conquered by the Peris, who were beneficent fairies, and reigned 2000 years under their king Gian-ben-gian. They too became corrupt ; and on account of their crimes Eblis, or the Devil, was sent by God to expel them, and confine them in the remotest corners of the

earth. After their dispersion Soliman Haki was the first king, and nine generations reigned after him. Caiamurath was the first king of Persia. He supported the remainder of the Peris against the Dives, who lived beyond the mountains of Demavend, of Caf, of Gog and Magog. Siameck son of Caiamurath was killed by giants. That king caused his body to be burnt, and thence the origin of the worship of fire. The kings of this first dynasty were called Pischa-dians. After the extinction of this race Caicobad, who was however descended from it, founded a new dynasty. It is also said in the traditions of this country that Surkage, a dives and giant in the days of Adam, reigned over the mountains of Caf. He obeyed the orders of God, and submitted to the father of men ; he forbade his subjects to molest the descendants of Seth, who at his request sent him Ruail his brother, and another son of Adam versed in all sciences, to enlighten him and govern his dominions. It was in those times that Caiamurath began to reign.

From these premises Mr. Bailly concludes that the Dives and the Peris were originally from the north, beyond Caucasus ; a mountain whose prolongation, under the names of Demavend, of Caf, and of the ramparts of Gog and Magog, bounds all Tartary from the Caspian sea to that of Corea. The denomination of Caspian gates, of ramparts of Gog and Magog, given to parts of this chain, the walls of China and Corea are, says he, unquestionable testimonies that the nations already established to the south of those bulwarks, natural or
artificial,

artificial, were ever employed in repelling the efforts of those powerful and numerous nations, who in their turns endeavoured to pass them. To me I own it only shews that the cultivating nations of the south were obliged to be upon their guard, as is still the case, against the depredations of wandering savages on the other side. According to our author, though surely that is nowhere intimated in the above passage, both nations were originally from the north of those mountains. In these conflicts one of these nations was almost entirely destroyed. From the remnants however of this antient root are issued all the nations since known in eastern Asia. Persia, Thibet, Indostan and China from it inherited the sciences they yet possess. The last site of this learned long lost nation he fixes amongst the lateral branches of Caucasus to the south. The lamas of Thibet and of Siberia, as far as Selinginskoi, are the true bramins, the sole lineal and unmixed descendants of that venerable race. Those still scattered in India yet make pilgrimages of devotion to their antient seats on the banks of the Jenisea. The Sanscrit language, foreign, says Mr. Bailly, to India, shews that the bramins are not originally of that country. The sacerdotal language in Egypt, as well as in India, was different from the vulgar tongue: in both countries this will only prove that the priests preserved immutable the language of their ritual, whilst that of the nation gradually altered, as has happened in every other country. The immemorial worship of fire in Persia and other places indicates, says he, a northern institution. But why northern, if the north in those antient days needed not adventurous

titious heat? Such are Mr. Bailly's *proofs* of the northern extraction of the Persians and the Indians; and he contends for a like origin to the Chinese in the following manner: A princess called Nanea, who came from the 62d degree of north latitude, founded the city of Nankin. The names of Gog and of Magog, of Gin and of Maggin, of Tchin and Matchin, are synonymous in the oriental languages (*c*). The province of Chanfi was the first inhabited: consequently the first inhabitants of China came from the north. Thus we see, says he, that the Chinese, the Indians and the Persians set out from that line of circumvallation traced throughout all Asia by Caucasus. The Grecian traditions lead the steps of the Atlantides to that same line. This chain was not only a bulwark, but a common origin. It must be owned however, that it is only by inverting the Grecian traditions that we can bring the Atlantides from thence. But the people of Gog and Magog, pursues Mr. Bailly, inhabited both sides of these mountains, for the particle *ma* signifies on this side. It denotes the Peris retrenched behind these ramparts constantly employed in repelling the Dives endeavouring to pass them.

In his rapid course Mr. Bailly ascends the great platform, the elevated grounds of Tartary. These vast platforms, extending from the Caspian sea to China, are divided by the lateral branches of Caucasus into several districts and vallies. From these high grounds the Indus and the Ganges fall into the Indian ocean; the yellow river takes its course towards the eastern sea of China; from thence proceed

ced all those mighty rivers which run into the frozen ocean. It is on these high platforms that now wander the Eleuth, Usbec, Kal-mouck, Kalcas, Mantchoux and Mongol Tartars. These high countries are consequently cold, want water and culture. They are thinly peopled in proportion to their extent: but he asserts that these present solitudes were the former scenes of an enormous population, from whence prodigious swarms of men have descended to overrun the earth. The depopulation caused by these emigrations may have occasioned, for want of cultivation, a sterility which was not felt in those times when a numerous people cultivated the country: but that cause is insufficient; the antients called the north the nursery of mankind: it was consequently once more fertile, it enjoyed a happier temperature than at present. Men multiply not so fast there in these times, since they send not forth, as formerly, numberless and repeated swarms. If these are contained by more warlike Europe, the effeminate people of Asia are not more able to prevent their inroads than heretofore. The real cause is then in the gradual cooling of the earth itself. Men advanced from the extremest north by following up its rivers to these high grounds: as their numbers grew too considerable, or as the climate of these elevated regions became too cold, they descended down those rivers, which conducted them to China, to India, Persia and Syria.

Having thus recognised the situation of the Tartar countries, our author interrogates their inhabitants concerning their antient traditions.

tions. Here follows their answer by Abulghazi, Khan of the Ufbeck Tartars, who reigned in Chorasan in the last century, and who wrote the history of his nation from their traditions and original records.

These Tartars whom we despise, says Mr. Bailly, have preserved their genealogies, and carry them up to Noah ; if they go not higher, it is because they are stopped by the deluge. He might have added, that they are not ignorant of that deluge, or of the generations from Adam to Noah preceding it. These people follow past times by regular generations and connected events. None except the Arabs are so jealous of their genealogies. According to the Tartars, Japhet son of Noah first peopled the banks of the Jaick and Wolga to the north of the Caspian sea. He was succeeded by his son Turk : he is the father of that nation which in the east is more commonly called Turk than Tartar : this last is only a branch. Taunak, son and successor of Turk, was contemporary with Caiamurath, whom the Persians erroneously style the son of Shem. This connects this history with that of Persia. The fifth successor of Turk was Alanzi Khan. It was under his reign that his subjects, effeminated and debauched by plenty, forgot the true God for the worship of idols. Our author remarks this plenty as a proof of the antient fertility of the country. It might be answered, that this, as yet very small nation, so near its origin, could not then want pasturage, sole riches of this soil. But let us proceed. Alanzi had two sons, Tatar and Mogul

gul or Mongol. Here the Turkish nation splits into two branches, into two empires, the one formed to the east by Tatar, the other to the west by Mongol. Ogutz, grandson of Mongol, obtained a great reputation, and abolished idolatry in his domains. It is with his reign that a settled chronology begins. Four thousand years elapsed between Ogutz and ~~Gengis~~ Khan, and Ogutz is thereby placed 2824 years before Christ. Ogutz was a conqueror, and subjected Tartary, China, and Persia. Mr. Bailly imagines these roving Mongols made not any permanent conquests, as he finds no traces of such, but that they are the same people with the Dives. This Mongol empire at last yielded to the efforts of the Tatars, for so they are properly called. The seventh descendant of Mongol was killed by the seventh successor of Tatar. Kayan son, and Nagos nephew, of the former, escaped almost alone the slaughter, and took refuge in Igna-cou, a valley surrounded by steep mountains. Their successors becoming more numerous endeavoured to escape from this kind of prison: by means of fire they made a passage through a mountain composed of iron. They yet celebrate an anniversary, when they light a great fire in which a piece of iron is melted (*d*). These two mother branches of Tartars still subsist round the borders of China under the names of Mantchoux and Mongols. They have sent colonies to all parts; amongst these are the Hungarians and Bulgarians. Hence our author concludes that all nations come from beyond Caucasus.

Jenghis

In this same Tartary Mr. Pallas has just made for our author a happy discovery of another antient lost people. He hesitates not, at the expence of his former favourites the Atlantides and the Peris, to adjudge to this new acquaintance the palm of antiquity, and of wisdom, and the treasure of original sciences. It is their still more northerly situation which procures them this complaisance. Tradition has given to this people the name of Tschouden or Tschoudaki. Happily too some learned man has also given to the antient Finlanders, though situated at 900 leagues distance, the same name; they were then a colony of these old Tschoudaki of Krasnojarsk on the banks of the Jenisei. They may have extended some branches even to Switzerland, where yet exists a noble family of the name of Tschoudi. This family surely owes something to Mr. Bailly, who thus bestows on it so antient an origin, perhaps just as well proved as that of many others. In the mountain of serpents (Schlangenberg) near the Irtysh this antique race had worked mines, and their instruments of brass and stone are yet to be found; but in their burial places near Krasnojarsk are found instruments, arms, and ornaments in brass and gold, figures of animals cast in brass and in gold well finished. They represent elks, rein-deer and stags, but yet nothing is found in iron. These different relics testify the state of the arts amongst the people who deposited them. The first seat of this nation has been near the Irtysh, the second near the Jenisei. The Mongols have from time immemorial known the use of iron, the Tschoudaki are therefore more antient. What moreover proves their
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high antiquity is, that in these mines the props that sustain them are petrified, and this petrification sometimes contains brass and gold. A sufficient time must then have elapsed since the mines were worked, for nature to have formed these metals, whilst time has destroyed the stones with which the buildings of a polished and numerous nation must have been built, before it fell into that luxury which the working of mines supposes. But here our author seems to have forgot what Mr. Gmelin tells us, that the most savage people of Russian Tartary, who rove about with no other habitation than occasional huts, have, notwithstanding, the art of melting and forging even iron in little furnaces erected in an instant, which our best artists would perhaps be puzzled to imitate. If those people made use of brass and gold, it was because these metals are more generally and easily found in those parts. Is it very necessary to look after the remains of sumptuous edifices for these Tschoudaki? He should not have told us the species of animals whose representation these very antient people have left us in their burial places. They lived according to him in times when that country, at present frozen, was fertile, and proper to produce and nourish a great population, and enjoyed a climate at least temperate if not hot. It was the excess of population which forced them to travel up the northern rivers, in order to spread themselves over the cooler high grounds amongst the mountains of Caucasus, from whence they afterwards descended. According to the principles of Mr. Bailly, those representations should have been of bulls, of horses, camels, and even elephants,

instead of rein-deer, which cannot live but in such cold countries as the present Lapland. These representations alone prove on the contrary, that these countries were then as cold as at this day. But no matter: this unknown and lost people, of which Mr. Pallas brings tidings, is the most antient of the globe. They cultivated the sciences; and though they have not made so much noise as others, they were wiser; they extended themselves by peaceful colonies, and not by sanguinary conquests. It is true we cannot give them all the honour of such wise conduct; they were alone on the earth, and had the soil only to subject by cultivation.

The derivation of languages (*e*) indicates the origin of nations, and Mr. Bailly forces the Greeks, the Phrygians, and all known people, to do homage to his new favourites. Their descendants the Finlanders, who yet preserve their language, celebrate a festival called Ioulu. The Athenians, according to Suidas, had one called Ioleia in honour of Iolaos, and certain hymns to Ceres were by them named Oulos and Ioulos. Alphabets will serve to range nations into distinct families. He perceives two principal ones: the family whose alphabet was at first composed of 16 letters, and that whose alphabet was composed of 20 or more. The Phœnicians, the Phrygians, the Etruscans, the antient Greeks and Latins, the people of the north, the Icelanders, the Teutons and antient Swedes are of the first. The Sanscrit language, that of the Zenda and the Pehlvi have 20 letters; these then belong to a different family in a more ad-

vanced state : the Indians and Persians descend from this. The manners and religion of the Phœnicians and Persians, though pretty near neighbours, were as different as their languages. The Phœnicians on one hand, the Persians and Indians on the other, though issued from the same source, as we are well assured by a conformity of traditions and astronomical principles, then left their original seats at different epochs, the Phœnicians sooner, the Persians and Indians later and in more polished times. Pergamus, the Phœnician name of Troy, is a northern word from Bergh or Berghen. Scaphe in Greek, scapha, scyphus, in Latin, are derived from schiphi or schypré (vessels) in the northern languages : the English call them ships, and the Curules to the north of Kamtschatka ship. The Theban Hercules was called Alcæus : it was only in consequence of his beneficent labours that that of Hercules was conferred on him as a title of honour ; the true Hercules was of Phœnicia, or rather of the north. Herfull or Herculle in Swedish signifies a chief of warriors. Hercules was also an emblem of the sun ; that worship comes from the north ; he was of the family of the Atlantides ; consequently the Atlantides were a northern people.

The antients vary as to the real country of the pretended Amazons. Some place them in Africa, and make them travel thence as far as Caucasus ; others make them neighbours to the Scythians. It was in Africa also that several placed the gardens of the Hesperides, and the name implies a western site ; but others in an island surrounded

rounded by darkness, and consequently according to our author in the north; and he, without pity, exiles them with their golden apples into an island of the frozen sea. The scene of almost all ancient fables will also be found in the north, though unjustly usurped by the Greeks. It had been thought that Homer placed the infernal regions in the western ocean: as the ancients believed that the sun set in that ocean beyond their horizon, it cannot be wondered that they should paint all beyond it as immersed in darkness. But this darkness recalls to Mr. Bailly the polar nights, and of course it was there Ulysses sought the entrance of hell. The better to support this conjecture, the ingenious author seeks and finds in some of the northern tongues the roots of the names of the infernal rivers. Pluto, the boat of Charon, in these find their etymologies, as well as Minos and Rhadamanthus. All the old heroes of fable sprang from the north. Their ancient country must however be more expressly pointed out, as well as that of the Atlantides and Dives, and of that ancient nation who fought against them. Plutarch will discover it to us; it is the island of Ogygia. That island, says this author, is distant from England about five days navigation towards the north west: near it are found three others, in which Jupiter detains Saturn a prisoner: the giant Ogyges or Briareus is set there to guard him. The great continent is distant 500 stadia from Ogygia. A multiplicity of rivers run down from it into a great bay opposite the Caspian sea. According to Mr. Bailly, these four islands are Iceland, Greenland, Spitzberg, and Nova Zembla; the bay is the gulph of the

the Oby. Plutarch says that their antient inhabitants lived in them with Heracles, and mixing with the people of Saturn renewed the Grecian nation. Some of these islands are inhabited by Greeks, and they have one day in summer in which the sun is scarce an hour below the horizon for a month. In that month part of the inhabitants go over to Saturn's island to serve, during 13 years, the god detained there in a profound sleep; captivated by the fertility of the soil and the softness of the air, they generally fix there for life. In spite of Grecian vanity, which has appropriated every thing to their own country, here, cries Mr. Bailly, truth breaks out. Saturn reigned not in Italy, nor Jupiter in Crete, nor the Atlantides originally in Africa; their first seats as well as those of the Greeks were in the frozen sea. The memory of the fine climate these parts of the north, now frozen, once enjoyed, is a complete proof of the gradual cooling of the globe. From thence therefore issued both the Atlantides and their Greek antagonists. At different times they passed over into the northern continent of Asia, from thence to Mount Caucasus and Caf, which they passed in defiance of the opposition of such as had already preceded them, to spread themselves afterwards over southern Asia and Europe. The oriental traditions confirm the fact. They talk of a dark region in which are situated the fortunate islands and the fountain of life, beyond the mountains of Caf; of a dry land long since inaccessible, where was the terrestrial paradise. That earth on which we live, say they, is surrounded by the ocean; but beyond that ocean lies another land which touches
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the walls of heaven, where man was created in a paradise of delights. It was during the deluge that Noah was carried by the ark to that earth which his posterity now inhabits. The Greek and oriental fables then unanimously indicate the origin of the Atlantides, and the antient feats of a lost people. If these corrupted Atlantides are the same as the Dives, if those destructive Dives came from those once fertile islands, they were also the original countries of the Peris, those fairies who saved us. In those times, when the internal heat of the earth was greater, and exceeded much more than at present that which is derived from the sun, these regions under the pole were the Elysian fields, the terrestrial paradise, the land of fairies, where Saturn reigned in a golden age.

It is from these traditions thus interpreted that Mr. Bailly thinks that he has sufficiently proved that all nations originally came from the north, and even from the frozen sea. He plumes himself on having fortunately discovered five primitive nations instead of one he sought for. These are the Atlantides and Dives, the Greeks and Peris, and the Tschoudaki so luckily found out by Mr. Pallas. It is however possible, says he, that the two first were of the same race, and the three last one and the same nation, successively perhaps emigrated from their happy islands; so that we may not in fact have more than two really distinct nations. He is inclined to think that the Tschoudaki, too multiplied on those propitious isles, were the first who landed on the Asiatic continent. Corrupted by the delights
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of the delicious plains of the Jenifei, they were not able to resist the Atlantides, who for the same reasons had followed them to the continent. Flying before these, they first retreated to the high grounds of Tartary, where they cultivated the sciences and astronomy, and whence they sent colonies into Thibet, and thence to Indostan and China. The Atlantides, pressed in their turn by other emigrants from those islands (the prolific nurseries of mankind), at length almost totally destroyed this first nation; and the Bramins, who took refuge in Thibet, are the sole remains of this most antient stock. These people, the Peris, and the first Greeks were the wise and primitive preceptors of the continent, the adorers of the true God under the emblem of the heavens or of fire. Their enemies the Atlantides at length forced the ramparts of Caf, and spread themselves in Syria, in Phœnicia and Greece, where they left their false gods, their festivals and fables. They are those conquering giants who overran the west of Asia and Europe under Bacchus or Osiris. The origin of nations is then far removed beyond the earliest records of history which have come down to us. Two thousand years have had little or no effect on the temperature of the earth. These antique nations, whose names have scarcely survived, existed in those ages when the northern polar circle was yet, on account of the supposed extreme heat of the earth, the only habitable region; judge then of their high antiquity. Certainly it will carry us not only beyond the highest Egyptian computations of time, but to ages almost infinite. Mr. Bailly draws not the consequence, but it is self-evident.

This consequence is very different from that which I have drawn from such of these traditions as I have examined in my first letter. From them Mr. Bailly concludes an almost infinite duration to this world; to me they appeared to confirm the writings of Moses, which restrict it to a comparatively very limited term. Permit me again cursorily to run over these antient traditions, and examine which of the two consequences will most naturally follow from them.

It is true that the Egyptian priest of whom Plato speaks gives 8000 years from the deluge to the time of Solon. We have already shewn what strong reasons there are to believe that Egyptian vanity had placed successively dynasties, many of whom had reigned at one and the same time over different districts of that country; and we have plain evidences of their having greatly antedated facts of pretty recent date. We have seen too, and we have Mr. Bailly's own testimony for it, that in the first periods of their history years are to be computed by lunar and not by solar revolutions, which by his own avowal in his last publication reduces this long period to nearly one fourth. From Uranus to the deluge we find not only in Plato but in the Persian traditions, another period of 9000 years reduced to about or less than 2000 by the Mosaical chronologies. But if any weight is to be given to these perhaps entirely fictitious periods, it will not be difficult to divine from whence they have thus been exaggerated beyond the truth. The lives of the antediluvian patriarchs

were generally extended to about 900 years. If the ten generations which preceded the deluge are placed, as has been done in the Egyptian dynasties, successively instead of collaterally, we shall find the same result of 9000 years. In the progress of such antique stories the mistake will surely not be improbable. To conclude this point, we have Mr. Bailly's own authority to settle this antediluvian period to between 2000 and 2400 years.

Let us now advert to the facts which fill these several spaces of greater or lesser duration. Mr. Bailly's forced and unnatural constructions of these several traditions need only to be exposed to evince their futility. Uranus, Saturn, Jupiter, Neptune, Hercules, Bacchus and Osiris, whether they were originally emblematical gods or men dignified by these surnames, are avowedly of Egyptian origin; and it is only by the most evident perversion and inversion of the fables relating to them that they can be deduced from the north of Asia, and much less from the islands of the frozen ocean. The story handed down to us by Plutarch of Saturn and the Greeks in the island of Ogygia is too absurd to merit examination; and even that is too ridiculously strained to answer Mr. Bailly's purpose. The island of Atlantis and the Hesperian gardens, violently transplanted from the western coasts of Africa to Spitzberg, is a poetical licence pardonable only to the poetical genius of Mr. Bailly. The Grecian fables of the Elysian fields and the infernal regions, of Pluto, Charon, Minos and Rhadamanthus, are avowedly fabricated on Egyptian ceremonies

used at the burial of their dead, and can only by the same license be transferred to the extremest north. To support it, Mr. Bailly cites authors who evidently contradict him. Homer says that Ulysses was transported in twelve days navigation from the island of Calypso, situated somewhere towards the mouth of the Adriatic gulph, to the extremest western boundaries of the ocean, where he found the entrance of the infernal regions; and this thus pointedly western situation Mr. Bailly is not ashamed to convert into the northern ocean. From the same frozen regions the Greeks are by him derived. That the first inhabitants of that country were of northern extraction with respect to it, we shall readily agree. They were part of the descendants of Japhet, who, skirting the borders of the Caspian and Euxine seas, first penetrated that way into Europe, and were thus related to the Hyperboreans, who in still later times inhabited those parts. But this is very different from deriving them from the frozen ocean, which was little or not at all known to the earliest Greeks, and its borders, by them thought uninhabitable from extreme cold.

To dwell any longer on these strained interpretations is surely unnecessary. It is time to see from what mutilated relics of real facts these antient traditions, the groundworks of which are everywhere commemorated in antique annals, can be much more naturally derived. In the traditions of a golden age, in the remembrance of the lost island Atlantis, of the Elysian fields, of the fortunate islands, of the inaccessible dry island, whose site is by no means determined by
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the orientals to be in the north, but indefinitely beyond or out of the bounds of the present earth, we may without any forced construction retrace the memory every where retained of the age of innocence, of a terrestrial paradise lost to man, of a once different habitation overwhelmed in the waters, and changed from its more happy primæval state. The great cause of this sad change is a prominent feature in all these traditions, and, as Mr. Bailly informs us, finds a place in the Chinese annals, where it is generally supposed to be least noticed. In all we find, as in Moses, ten generations of men preceding this great catastrophe occasioned by the crimes of that former race, from which a few only escaped to repeople the new world. In Sanconiatho a son of Uranus killed by his brothers, in Diodorus the virtuous Hyperion meeting a like fate, Siameck son of Caiamurath killed by giants, in the Persian annals evidently represent Abel killed by his brother Cain. In Diodorus, Hesperus one of the descendants of Uranus taken up from the earth by the winds recalls the history of Enoch in sacred story. Every where, as in the writings of Moses, giants appear in those times, whether by them are meant men of extraordinary stature and strength, or powerful and wicked men. In all these annals we find men at first virtuous, finally corrupted, and perishing in a general deluge. Amongst the Persians the story of the Dives or the giants, and the Peris or the fairies, seems a confusion between that of the good and bad angels, and the children of God and the children of men. With the Persians as with Moses both are at length corrupted, and, except a chosen few, are utterly exterminated.

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The ten generations from Soliman-Haki probably represent those which succeeded from Adam. A new dynasty, invariably called the first, as that of Yu is in China, but yet issued from the Pischadian race, commences after the extinction of this last. Adam, Seth, and Noah preserve in these traditions their Mosaic names. But with the Tartars, as well as the Arabs, not noticed by our author, both equally careful of preserving their original titles, the names and the genealogies of their descendants are found still more nearly corresponding with those of Moses (*f*). They derive their origin from Japhet one of the sons of Noah, and it is to him the sacred writer attributes the population of northern Asia and Europe. His sons or grandsons, Gomer, Turgoma, Gog and Magog, are acknowledged the fathers of all the nations inhabiting those parts of the earth, and from them they take their names. It is from the more faithful traditions of the Tartars that we learn to rectify those of Persia; and their first king is neither, as they seem to wish to have it believed, the first man, nor Noah, but contemporary with the grandson of the latter. Such are the applications which we think may be fairly made of the general substance of these traditions to the Mosaic narration, and which we presume strengthen these with all the united weight which they can give them. They are partial remnants of a truer history. It is true they appear in those annals confused, and more or less disfigured and altered to serve the vanity of particular nations; much less adulterated however amongst the simpler nations than amongst the Chaldeans, Phœnicians, Egyptians, and Greeks, where the interests of idolatry

idolatry have nearly hidden them under an absurd addition of fable; but even in these last some principal and leading facts pay homage to the simple narrative of the Jewish legislator.

Mr. Bailly had, as we have observed, found amongst more than one of the most antient nations now existing, certain rules and methods of calculating eclipses, several learned astronomical periods, and particularly one of 600 years, which, as the theory is now entirely unknown to them, they must have inherited from some more antient and truly learned people prior to them all. We have seen with what ardour he has rummaged all antiquity to discover a lost antient nation, or at least a name to whom he might attribute this original source of wisdom and science; we have seen too with what legerdemain, to serve a still more favourite purpose, he has, without respect to the authors of these tales, unmercifully transplanted these fabulous people from the southern latitudes in which they fixed them to the frozen ocean. Mr. Pallas had in Siberia heard of an extinguished horde called Tschoudaki. In those savage climates, a whole tribe or family exterminated in their cruel wars is, alas! no uncommon event. But this hint is sufficient for our author to adopt this horde, created by his powerful imagination into a mighty nation, whom he at full pleasure, since no trait in history can contradict him, adorns with all plenitude of wisdom, virtue, and science. Their more northern situation inclines him even to give this last discovered people a marked preference to his former favourites, as well in priority

rity of antiquity as in excellence. Such are the nations, or rather names, whose very existence depends on Egyptian or Persian legends, or on the tales of Siberian savages, whom Mr. Bailly has selected to be the great original instructors as well as fathers of mankind. But without wading through fabulous legends, or travelling from the Streights of Gibraltar to Spitzberg, Moses had already offered him an antient people, to whom every early tradition he has cited much more unequivocally refers; who must have been the original fathers and the first sources of knowledge preserved by the few who escaped from that general deluge which all of them avow. This people is the whole race of antediluvians, under whatever name they may have been known by various nations. Some persons, I know not why, seem to figure to themselves this antediluvian race as inconsiderable in numbers and destitute of knowledge. But surely the middle term of their existence on the earth, 1656 years, is amply sufficient, under the peculiar circumstances of that happier age, to have fully peopled the whole earth. It is even probable that men were then more numerous than at present, and the calculations which have been made make their numbers at least twenty times greater than that of the actual inhabitants of this new earth. Ignorance is with full as little grounds attributed to them. Moses is indeed very concise, but what little he says of them denotes an early polished and civilized people. Cain the son of Adam builds the first town; Tubalcain was expert in works of brass and iron; the sons of Jubal invent music and all kinds of instruments. Powerful men
arise,

arise, and luxury is their final ruin. Noah, who with his family was alone saved from the wreck, was an expert husbandman, and before the flood built (*g*) the largest ship which ever yet existed. The dimensions and particular form for a particular purpose were indeed prescribed to him ; but it may be thence fairly inferred, that navigation was not totally unknown. Soon after the deluge, his posterity undertook to build a tower, the plan of which, however senseless the motive, was certainly the most vast and magnificent ever yet imagined.

The longevity of the antediluvians, probably owing to a more wholesome state of the earth and a more propitious temperature of the air, certainly authorises us to give them more opportunity to acquire a knowledge of the heavens, to repeat their observations, and bring astronomy to higher perfection. I shew you, Sir, in my next letter, if not with certainty at least with great probability, that the first rules and methods of calculating eclipses, still preserved in practice by those nations Mr. Bailly mentions, are of antediluvian date, to which in after times their posterity added certain corrections necessary to suit with the altered position of the globe. Neither Noah nor his sons were perhaps professed astronomers ; but they were probably sufficiently informed of the general theory and practical rules to transmit them to their posterity. The practice those nations, ever remarkable for a scrupulous observance of their antient

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usages, have retained ; but the principles, if ever known to them, have been lost in the lapse of time.

From a coincidence in sound and import of some Grecian names to northern languages still in use, Mr. Bailly infers a northern extraction. We will readily agree with him, that some principal roots both of antient and modern European languages may be traced up to the Celtic, the original language of the sons of Gomer. Considering the mixture which has at various times in all parts of Europe taken place of these descendants with more southern nations, it is surprising that such frequent traces of a common origin can yet be discovered. But will these conformities give the smallest proof, or semblance of proof, that this original language was framed in Spitzberg or Nova Zembla ? The first language must have been inspired or infused ; and we are told that Adam, soon after his creation, named all the animals of the earth according to their natures. Rousseau, who rejects all miracles, merely because they accord not with his notions of philosophy, yet allows that the first formation of a language is incredible and incomprehensible from the sole powers of man. Moses informs us, that before the dispersion all mankind had one tongue and one voice. In punishment of a rebellious attempt which seemed to bid defiance to God, and in order to force upon men the command of dispersing according to families in order to people the earth, their language was confounded. It was probably
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at first split into three tongues only; and this might be effected at first more by a change of accent and pronunciation than of words. Of various and multiplied conformities in the roots of these we have yet evident traces in all languages of the earth, and this will certainly prove one common origin to all. Mr. Court de Gibelin has with uncommon ingenuity evinced this almost beyond contradiction, and thence began a new grammar to several principal languages, from which he meant to deduce one common grammar, which would easily lead to the comprehension of all languages and dialects. Unfortunately for the world, poverty and death put an end to this laborious enterprise, or at least to its publication, for he asserts the materials to have been ready. He certainly bid fair to fulfil his promise in a very satisfactory manner. The conformity will certainly be greatest amongst those derived from the three first divisions of tongue; and of this we have the strongest proofs in the similarity of roots in the languages of nations dispersed over immense tracts of the globe. Alphabets, or the reduction of sounds to a certain number of elements, are a later invention, more or less improved at various times in different nations, and will scarcely be any proof of the distinction of nations into families. Whatever inferences may be drawn from the derivation of languages will then certainly tend to corroborate the Mosaic account of mankind, and will by no means serve Mr. Bailly as the slightest evidence of the polar circle being the first inhabited part of the earth.

There is yet another part of Mr. Bailly's reasoning which it behoves us to examine. From the successive inundations of men which some parts of history represent to us as issuing from the north to overrun and lay waste the earth, he concludes that the north was in antient times the fruitful nursery of mankind, or, as the Latins called it, *officina generis humani*. It must be granted that this denomination, which has passed from mouth to mouth, has formed a prejudice in favour of this opinion ; but it becomes not philosophers to adopt any without previous examination.

We know from the example of the savages of America, that to the smallest tribe living upon the produce of the chase, the sole resource of cold uncultivated climates, a very great extent of country is required. Somewhat less suffices for the subsistence of shepherd nations, but yet far more considerable than is necessary for the support of a settled people who apply themselves to cultivation. The northern Tartars are in the first class, and those who wander through the vast tracts of more southern Tartary are yet to be reckoned in the second. In consequence, a population which would be very small for a nation of husbandmen would be too numerous for a country, even in more favourable climes, abandoned to simple nature. Soon then must these inhabitants either exterminate one another, or seek a subsistence for gradual increase, by pouring in their supernumeraries upon their more provident neighbours; and these Tartars, ever wandering and on horseback, have at all times been as prone to as rapid
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in their invasions. The sole professions known or esteemed in those countries are those of shepherds and warriors. Whenever the whole country is overburthened by numbers, necessity prompts them to unite in extending the means of subsistence. Two or three hundred thousand ferocious men falling suddenly, and with that rapidity of march which belongs only to Tartar nations, upon their peaceful cultivating neighbours, naturally dismayed them, and fear inclined them to suppose that these northern tracts swarmed with men. Were it possible that all the inhabitants capable of bearing arms, of London or Paris, and of twenty miles in their circumference, should suddenly take it into their heads to change their habitations, and emigrate in a body to invade their neighbours; from armies thus numerous, these would very naturally conclude that England and France were much more populous than they really are. Three hundred thousand men form an immense army, but a very small nation.

But Mr. Bailly pretends that it was in times very remote, in times when the north well cultivated enjoyed a happy climate, that the polar parts of the earth were the nursery of mankind. It must then have been at a period prior to all history, to all memory of man. The most antient records afford no notices of such early emigrations; those which history does mention are too recent to approach these fancied days of northern fertility. The higher it carries us, the less we hear of northern irruptions; nor does it point out the smallest

smallest incident from which we can infer that our own climates, or those of Europe, have grown cooler within these 1800 years. On the contrary, if any change has taken place, it has been in diminution, not in increase, of cold; and the climate of Europe seems to be more temperate now than in the days of Cæsar (*b*). That able observer thought it not possible that vines should flourish beyond Vienne in Dauphiny. Horace tells us that the Tyber was sometimes frozen over; which never happens in our days. The emperor Julian, who was not surely effeminate, speaks of the cold of Paris as insupportable. For a change to warmth philosophy accounts. The cultivation of Germania and Gaul, and of more northern countries since those times, has softened the rigour of our winters, as a like circumstance has certainly done in North America. If in some centuries hence the whole of Russia comes to be cleared and cultivated, we may venture to predict that the cold of those climates as well as of ours will be sensibly diminished. The possibility then of the north enjoying that mild climate our author speaks of, is necessarily thrown back to an immense distance of time.

It is not therefore any change of temperature beyond all possibility of record which occasioned the antients to call the north the nursery of man; frequent irruptions of northern armies, from whose numbers they erroneously calculated the population of those climates, were the cause. Let us therefore examine the dates of those irruptions which history records. They will not answer Mr. Bailly's end;

for they will, on the contrary, shew that a much longer time was required to give even such an inferior population as might overburthen shepherd nations, than was necessary to raise it to an overflowing height in cultivated countries and in more propitious climates. In the early periods of Asiatic history we hear nothing of northern invasions; on the contrary, all such proceed from the south (*i*). During the great power of Assyria nothing of the kind appears. The first notice we have of any northern irruption is after that power declined, when the Scythians invaded Media, and held possession of it during 28 years, in the 609th year before Christ. They were expelled; and though that nation was sufficiently provoked by Cyrus, we hear no more of their stirring beyond their frontiers, where cold and deserts guarded them from ambitious monarchs during the whole duration of the Persian, Grecian or Roman dominion in Asia. During all that time, if their numbers became too great for the pasturage which their then country afforded, they must have disburthened it of their superfluous numbers by spreading either to the east towards China, or to the west in northern Europe. Contrary to the supposition of Mr. Bailly, all conquests, fabulous or real, in the earliest times are said to be, or were really, achieved by southern nations. Bacchus, Osiris, Semiramis, Sesostris, set out from Egypt or Chaldea. The Assyrians, Babylonians, Medes, Persians, Greeks and Romans, who successively domineered in Asia, were nations south of Caucasus. But in opposition to facts Mr. Bailly asserts, that by the unerring rule of philosophic theory southern nations

tions are unfit for conquest and distant expeditions. I suppose he means the nations south of Babylon. But how shall we rely on these philosophic reasonings? The thirst of dominion will rouse even the most indolent nations into action, notwithstanding this influence of climate. Some of the former mentioned conquests may be fabulous; but he will not surely deny those of the Arabs under Mahomet, the most rapid, the most extensive, and the most permanent that history records. To this day, as appears by the travels of Mr. Niebuhr, these same Arabs, under nominal submission to the Sultans, are the real masters of all interior Asia, ransoming at pleasure even the coasts under their more immediate command. To find any northern dominion in Asia, we must come down to the 12th, 13th, and 14th centuries after Christ, when the Turks and Turcomans seized the Arabian thrones, and when ~~Cengizkan~~ and Tamerlan overran all Asia, and gave new sovereigns to Persia and Indostan (*k*). It was in this same 14th century that the Tartars first made themselves masters of China; and it was in the last age that new Tartars again conquered that country, in which they at this day reign.

Jenghiz-Khan

In Europe, the first appearance of a northern invasion was that of the Gauls who sacked Rome under Brennus in 390 before Christ. That people had settled about 280 years before in northern Italy, till that time probably uninhabited. But the rising power of Rome soon checked all farther attempts, and the Cisalpine Gauls with every
other

other Italian nation submitted to the Roman yoke. It was 200 years after that the Teutones and Cimbri, having traversed Gaul with an army of 300,000 men, again threatened Italy, and were totally defeated by Marius. During the first Roman emperors some northern barbarians began to press on the frontiers of the empire in Illyria, Pannonia and Dacia; but they were yet contained within their limits by its power, and served only to recruit the Roman armies. It was not till the decline of that empire, in the fifth and following ages after Christ, that these invasions became frequent and formidable; and that several northern nations, the Franks, the Germans, the Huns, the Alani, the Goths, Visigoths and Vandals, successively broke in on all sides on that empire already crumbling under its own weight, and weakened by the corruption and indiscipline of its armies. In the ninth and tenth centuries the Saxons, Danes, and Normans invaded England and France. However barren the countries from whence all these invaders issued, yet are we well assured that they were less cultivated, and consequently less populous, in those times than at present. It appears then that the first trifling and unimportant northern invasions date not more than 2400 years before the present times; that the first of any importance took not place in Europe until the 5th century after Christ; and that no northern nation made permanent conquests in Asia until the 13th century. Every circumstance recorded in history proves that the temperature of Europe is not grown colder now than it was 1800

years ago ; many indicate the contrary : the great irruptions of northern nations into Asia are too recent to suppose the smallest sensible change. Shall we then be told that the happy climates of Spitzberg, Siberia, or Norway, in those so very little distant days nourished an immense and overflowing population ? Mr. Bailly will not pretend it. We may then conclude, that no known irruption of northern nations gives the least support to this author's system ; but that it appears that the barren and uncultivated tracts of northern Asia and Europe sufficed, for more than 2000 years after the dispersion, for the subsistence of the population which had during all that period been very slowly spreading itself over those immense regions. It was not till after that lapse of time that those countries became overcharged with inhabitants, and that, forced by necessity, those barbarians began collectively to press on their southern neighbours. It was from their first success in Media, which they held 28 years, that they first began to learn to increase by industry beyond the pure boon of nature the means of subsistence ; and it was not till they had done so that they became sufficiently populous to be really formidable. The population of all Tartary is still very scanty if compared with an equal extent of any cultivated country, and was from internal evidence much more so before the times we speak of. The argument founded on an old popular prejudice instilled by fear, is therefore not more solid than those forced inferences which our author has drawn from antient traditions glaringly perverted

perverted to his purpose. That this has been every where the case, the simple exposition of his evidences and of his conclusions sufficiently proves. On the other hand, the consequences which I had deduced from these and numberless similar records flow from them most naturally and without constraint. We can scarce dissemble to ourselves, that the groundwork of all these traditions seems originally laid on the same foundations with the Mosaical accounts, every circumstance of which is to be found in some one or other of them. Even the proper names made use of by that author, although changed in some nations by a vanity which appropriated to themselves the supposed merit of prior antiquity, or adulterated to connect them with their absurd mythology, appear without any alteration amongst those simpler nations who have more scrupulously preserved their antient traditions and genealogy. In one important point, the attestation of a general deluge, all these scattered fragments concur with the whole general tenor of the history of man. We have already seen that this author, in a later publication, avows that its date cannot be carried with any probability higher than 3501 years before Christ. The event itself, whether it happened a few centuries sooner or later, annihilates the whole system of Mr. de Buffon, which asserts the whole earth to have been in a state of ignition, and that it has been gradually cooling in a series of many thousand years: whence he deduces the polar circles to have been the first possible habitation of man, and that from thence all popula-

tion proceeded. All the ingenious subtleties of Mr. Bailly fail, as we have seen, to give the smallest support to this chimerical hypothesis, either from the traditions or history of man, however distorted to the purpose. On the contrary, all history shews us that the first appearance of great population was in south-western Asia and the southern countries most contiguous to it; that from them, as from a centre, it was slowly spread to the nearest, and progressively to more distant regions; and that this extension happened so many ages after the date assigned by that author for the deluge, that there is thence great reason to suspect that it is by him removed several centuries beyond the truth; that at all times since that period the northern parts both of Europe and Asia have been less cultivated and civilized, and consequently much less populous, than the southern. Our own knowledge assures us, that the former, though they have gained much in very recent times in all these respects, by a greater intercourse with more polished nations, are yet, and are likely to continue several centuries, proportionably less populous than even the climate might permit, and that fear alone could have produced the idea that they at any time nourished an uncommon population. From no circumstance of tradition or history can it therefore be inferred, that the north was the original seat of mankind since the general deluge, or that, as Mr. Bailly contends, all population was derived from thence. From that great event, the only fact concurrently and invariably testified by all those traditions to which Mr.

Bailly

Bailly has had recourse, and the date of which they equally point out not to be very antient, the continued and connected traces every where discoverable of progressive colonization from southern interior Asia give, on the contrary, the fairest and most unequivocal testimonies that the renovation of mankind had there its commencement, and that population was thence slowly and gradually diffused both over the north and over every other part of the earth.

NOTES AND ILLUSTRATIONS

TO

LETTER II.

(a) Page 208.

WITHOUT reckoning an island Atlantis in the Gulph of Egina, not far from Athens, there was also another island of that name between that of Eubœa and the Locrian coast, detached as the ancients supposed from these contiguous lands by a great inundation; or rather this spot remained in the straits when the island of Eubœa itself was torn from Bœotia by the irruption of the lake of Thessaly, which according to Herodotus formerly covered the plains of this last country. This island Atlantis was conquered by the Athenians, but was soon after sunk and almost entirely destroyed by an earthquake. Is it not this island which Plato, taking advantage of Egyptian tales, has transported beyond the straits of Gibraltar, in order to give us an ideal history of felicity springing from virtue, and of punishment and misfortune consequent to corruption? It is true, one sees not how such an island could conquer Libya; but the inhabitants of an island in the Atlantic ocean were not more likely to make war on Egypt or Athens. Wars in the western world, yet thinly inhabited, were, in the times we speak of, that is to say, about 3300 years ago, little more than the descents of restless pirates who frequently changed their habitations, and made no long voyages, unless forced by storms beyond their knowledge. It is then much

more probable that the coasts of Egypt and the yet village of Athens should have been assaulted by adventurers from an island in the Egean sea, than attacked by a great nation living beyond the columns of Hercules. Beyond the interior of Asia and Egypt, nations, some centuries after formidable, were yet petty tribes composed of a few families of adventurers. Fifty or a hundred persons united to seek new settlements on the desert coasts of Europe and Africa, and to seize on the first country to their liking. These were not unfrequently expelled by succeeding ones, and were again forced to seek new seats wherever they found the least opposition. In times much later, in all civil contentions the emigration of the weaker party was the constant and sufficiently wise advice of the oracles of old. Such is the whole history of these parts of the world in those times. Can we doubt that the renovation of the human race was little distant from them? Some adventurers from the Grecian islands of Atlantis were probably cast on the western coasts of Africa, and gave the name of their country to mount Atlas and to the neighbouring sea; as discoverers in more modern times have given their own names, or those of their original countries or towns, to much more extensive regions.

(b) Page 209.

Some have supposed Sanconiatho contemporary with Joshua; Sir Isaac Newton, with more probability, to have flourished about the year 760 before Christ. He wrote in Phœnician, and his works were translated into Greek by Philon of Byblos, of which Eusebius has preserved some fragments. However faulty his description of the origin of the world, we cannot but remark several traits corresponding with the narration of Moses. It is true the hand of the great architect, of God, is wanting, but the chaos therein mentioned is the abyss; the wind is the breath of God; the mud he speaks of represents the first liquid state of the earth. Light is produced, and soon after the sun and stars appear. Marine and terrestrial animals are successively animated; and lastly, the first man and woman vivified by the wind or breath of God. The same order of production is observed. The doctrine

doctrine of Orpheus, as it is preserved to us in abridgment by Timotheus the chronographer, is, that God, or the first being, invisible and incomprehensible, author of all things material and immaterial, created, in the beginning, the æther or the heavens, and beneath them chaos, and night or darkness, which last covered all things under the æther, which, as well as the earth, was by that means invisible until light, which he seems to think God himself, piercing through æther, enlightened the whole creation: the Divinity then formed man from the earth, and communicated to him a reasonable soul. This system of the creation, as well as that which Ovid sings, probably taken from the doctrine of the great mysteries, approaches still nearer to the Mosaic account, and is visibly drawn from the somewhat obscured and mutilated traditions transmitted from the first men escaped from the deluge. As the true religion wore out in the minds of men, these were variously accommodated in different countries to the reigning mythology, till at last sceptic philosophy substituted plastic Nature to an intelligent author, and is now again straining every nerve to reduce us to the same point. Our advanced knowledge in the admirable concatenation of all existing beings, and the avowed insufficiency of fortuitous Nature to produce one single new entity, or to swerve one line beyond the bounds assigned to it, are inadequate to repress the ambition of framing new systems, however absurd. Intoxicated by the pride of some fortunate discovery in the ordinary course of nature, the vain philosopher thence presumes to scan the power of the Almighty by his own narrow conception: according to the process of his little laboratory, he scruples not to measure out time to the operations of that Being from whose fiat she received her laws, and literally makes himself the god of God.

(c) Page 214.

The ramparts of Gog and Magog, so often mentioned in oriental history, shew us the first seats of those children of Japhet called by those names by Moses and the scriptures. From those mountains they descended into China, which to this day retains their name. These names softened, as Mr.

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Bailly informs us, into Gin and Magin, Tchin and Matchin, by the oriental Tartars and Chinese, sufficiently prove the origin of the latter. The denominations of Tching, of Tſing, of Tſin and Tſi, given by the Chinese to several of their dynasties, are further testimonies of the genealogical claims of their first sovereigns. We see thence, that Moses indicates to us with no less truth the fathers of far distant nations than the origin of those who had nearer connections with the children of Abraham. Their descendants, unknown to the Jews, and no less so to those nations who successively lorded it over the western world, were only made known to us a few centuries ago, still bearing the very name of that Mosaic patriarch. Mr. Huet, the learned bishop of Avranches, tells us, that the oriental Scythia of the ancients was the country to which the Arabs, who alone in the south retained the memory of ancient appellations, gave the name of Gog and Magog. In the most eastern parts of Asia, he says, the ancients placed three nations, the oriental Scythians, who occupied Chinese Tartary; the Seres, who inhabited northern China, or, as I am more apt to believe, northern India; and the Sinæ, who held the southern part of China. These last were faintly known to the Romans by the commerce in silk during the reigns of their emperors. The names of Sinæ or Thinæ, indifferently attributed to this nation, are such slight variations of Tchin or of Tſin, that we cannot doubt but that the Chinese were thereby meant, though the Romans were yet ignorant of the true situation of their country, undiscovered till the Portuguese sailed round the Cape of Good Hope. In process of time the country of the oriental Tartars was known under the name of Caracathay, or black Cathay, and that of the Seres was called Cathay, the same as the Cathæan region of Strabo inhabited by the Chætean Scythians of Ptolemy. In the 14th century southern China was called Mangi, or Matchin, by the Tartars. Those who wished to give an imposing antiquity to the Chinese empire, have represented it as having from earliest times reunited all its present provinces; but it is certain that, conformable to this division of the ancients, the northern and southern parts of it continued till after that time entirely separate and distinct dominions. Northern China itself long continued divided into
separate

separate states, acknowledging, like Germany, one titular head of the empire; a distinction probably given to the descendants of Gog by eldest sons. In one of these subordinate co-estates, Confucius, himself of the race of its sovereigns, was born in 550 before Christ.

(d) Page 217.

Cayat was the name of a horde which the Mongol Tartars esteemed to be the first in rank. That horde became extinct; and under claim of some alliance Cabal-Khan, great grandfather of ~~Gengis~~ Khan, added the surname of Cayat to his own horde, called Niron. Hence that chief claimed by descent, as well as by his exploits, to be Grand Khan of Tartary. That more ancient tribe had formerly established iron forges on a mountain called Arckenhom, whence all Tartary was furnished with arms. It was in honour of this horde as general benefactors, and not in memory of the fable Mr. Bailly here gives us, that this festival was instituted. Vide Petit de la Croix, History of ~~Gengis~~ Khan, taken from Tartar and Arabian authors.

(e) Page 220.

Mr. Bailly would no doubt exult to find, in Captain Cook's third voyage, the most probable reasons to think that the language of Greenland, or, if he pleases, of the ancient Finlanders or Tschoudaki, is the mother tongue of all those that are spoken throughout the northern parts of both hemispheres. It may also, as he imagines to perceive, have some connection with the Celtic, and thence with the Greek and Latin languages. But this will only render more probable, what Moses had already told us, that all the northern world was originally peopled by the descendants of Japhet. Conjecture against conjecture, would it be absurd to suppose, as I have already remarked, that only three absolutely distinct languages were formed on the confusion of tongues, attributed to the three races who divided the earth; and that from these three mother tongues all other dialects are derived? Not many years ago, celebrated philosophers assured us with triumphant confidence, that the great distance and vast seas interposed between the old and

new world rendered an absolutely distinct generation, both of men and animals, necessary for the peopling of America. It is only since Cook's last voyages that these pretended invincible objections to one common origin of men fall of themselves. He has proved that western America is only separated from eastern Asia in latitude 66 north by a strait of not more than 13 leagues over, and that their distances for many degrees south of it are interspersed with innumerable islands. By a conformity of manners, and slightly varied idioms of one common mother language, he has also shewn the filiation of divers nations, on whose origin these philosophers affected to be embarrassed. All the tribes of north America from the 195th to the 345th meridian from Greenwich speak the language of Greenland. That rude language, suited to the paucity of ideas of the inhabitants, has suffered little variation in that vast circumference. The old Celtic will probably be found to bear great affinity to it. This last, yet spoken by the commonalty in sufficiently distant parts of Europe, in Lower Brittany, Wales, the Highlands of Scotland, Ireland, and some districts of Spain, is still to be retraced in the roots of many Greek and Latin words. But these were polished and refined by knowledge and science, and the former no doubt greatly enriched by intercourse with Asia and Egypt. With the Roman empire the Latin particularly spread itself over all southern Europe: but a mixture of Celtic and Gothic again adulterated the speech of all its various nations, in all whose tongues remnants of all these languages may be traced. The language of the arctic circle, that of Gomer, is probably then the mother of all the various tongues which have been, or are, spoken in Europe. His other sons, spread in a more southerly tract of eastern Asia, framed to themselves a very different dialect. Mr. Cook has also shewn us, that all the different tribes dispersed in that multitude of islands which have been visited in the Pacific and Eastern oceans, speak a dialect very slightly varied of the Malay language; whence it appears that that nation, which Mr. Roberts very judiciously calls the Phœnicians of the east, has colonised them all in an extent of 180 degrees, or half round the globe.

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These important voyages have also shewn us by what accidents all these islands, whose clusters are often separated by extensive seas, may have been peopled. They demonstrate that America may not only have been peopled from northern Asia, but also by like accidents of storms driving very frail vessels hundreds of leagues beyond their intended destinations, at various and distant intervals from these islands, from Japan, China, and all the oriental coasts and islands of Asia. Better constructed ships of the Phœnicians and Carthaginians, those bold navigators of antiquity, may have also been driven from the west to people the south and east coasts and islands of that continent. The interior of America is as yet too little known to the learned world to insist much on the vestiges of antient times which may yet remain in it. The sordid policy of Spain has been intent on keeping the rest of the world as much as possible ignorant of by far the greatest share of it. It has been said, that the language of some of the north-western tribes bears great affinity with the Hebrew. In that case, a dialect derived from one of the antient languages of the sons of Shem would prove that this race has also contributed to people that country. If it is true that an inscription on a rock in New England is in the Phœnician language, it will also shew that this antient people, of the line of Cham, had also some share in its colonization. That the northern Tartars had, there can be little doubt; and thus it will have received inhabitants from all the three races descended from Noah; and it will not be surprising if some traces of their different languages be yet found amongst its various tribes. The greatest part of its savage tribes owe, no doubt, their origin to the barbarous nations of northern Asia. But more polished emigrants from more southern Tartary, from Japan, China, India, and the Malay coasts, may have also landed there, and thus have been the progenitors of the Mexicans and Peruvians. It is affirmed that regular fortresses in stone, and even in brick, have been discovered on the banks of the Ohio. These would certify that those parts were, at some time or other, inhabited by people much more advanced in the arts than are the present savage race. Whilst these last are sprung from the wandering tribes of northern Asia, of Greenland, and the Laplands: the former

former were probably fugitives dispersed by the revolutions of Japan, of China, or of India beyond the Ganges. Their first abodes seem to have been in northern America, most contiguous to their former countries, whence they passed on to more favourable climates. We know that the Mexicans came from thence ; and the Natches, a nation exterminated since the beginning of the present century, seemed to have been the remnants of those more polished emigrants who had continued in Florida. Like the Peruvians they adored the sun, and pretended their sovereigns issued from him. This worship was that of the Asiatic nation, from whence they came, at the time of their separation. The Natches and Peruvians were probably of the most antient polished stock settled in that continent ; whereas the Mexicans seem to have come later into that part of the world.

(f) Page 230.

Etymologies, often conjectural and frequently strained, are certainly a weak basis on which to build historical truths ; but when to names, as nearly resembling as different languages and pronunciations will permit, similar actions are attributed, it becomes unreasonable scepticism not to allow, that by them the same personages are meant. In Mr. Wilford's learned disquisitions on Egypt and the Nile, from the antient books of the Hindus, contained in the Asiatic Dissertations, we cannot help remarking many etymologies, tending to deduce from India both Egyptian and Grecian fables, to be somewhat forced. The bias of the author, as well as of the Indian legends, to attribute both the sources of science and of population to that nation, is no less conspicuous. But there is a passage cited by him from the Padma-puran, and translated by Sir William Jones, which is too evident and strong a confirmation of the Mosaic account of the deluge, and of the derivation of the present race of men from the three sons of Noah, not to be here transcribed. In this we find not only the names of these three patriarchs, as nearly similar as can be supposed in different languages, but several remarkable circumstances exactly coinciding with the more simple narrative of the Jewish historian. As we have already
noticed

noticed in a former note, the person saved with eight attendants in a boat from a general deluge by the Indian god Vishnu is by them called Satyavrata or Satyavarman, a name certainly very unlike that of Noah, but which is probably a title of honour. But whatever name may have been given to him by various nations, the circumstance of his being thus saved can belong only to one and the same person. The passage runs thus :

1. To Satyavarman, that sovereign of the whole earth, were born three sons; the eldest Sherma (in the vulgar dialect Sham); then C'harma (vulgarly C'ham); and thirdly Jyá-peti, by name.

2. They were all men of good morals, excellent in virtue and virtuous deeds, skilled in the use of weapons to strike with or to be thrown; brave men, eager for victory in battle.

3. But Satyavarman being continually delighted with devout meditations, and seeing his sons fit for dominion, laid upon them the burden of government.

4. Whilst he remained honouring the gods, and priests and kine, one day, by the act of destiny, the king, having drunk mead,

5. Became senseless, and lay asleep naked. Then was he seen by C'harma, and by him were his two brothers called.

6. To whom he said: What now has befallen? In what state is this our sire? By those two was he hidden with clothes, and called to his senses again and again.

7. Having recovered his intellect, and perfectly knowing what had passed, he cursed C'harma, saying: Thou shalt be the servant of servants.

8. And since thou wast a laughing in their presence, from laughter shalt thou acquire a name. Then he gave to Sherma the wide domain on the south of the snowy mountains.

9. And to Jyá-peti he gave all on the north of the snowy mountains; but he, by the power of religious contemplation, attained supreme bliss.

This passage is a further proof of what I have already advanced, that there is scarcely a single circumstance of Moses's account of the deluge, which may not be found in one or other of the primitive traditions of nations.

tions. Sir William Jones very properly remarks, that this passage fixes the utmost limit of Indian chronology to the æra of Noah. To the objection, that Moses had drawn all his accounts from the Egyptians, we may also answer with him, that it is indeed probable that at that early period all nations had preserved some particulars of the great event of the deluge. With the Egyptians and Indians they were already adulterated by a mixture of fable and allegory, and all their accounts were obscured by a redundancy of fictitious incidents. If that venerable author drew any thing from those sources, it was the plain unadorned truth, expressed with that noble simplicity which belongs to it.

(g) Page 233.

According to scripture, the ark was 300 cubits in length, 50 in breadth, and 30 in height. Taking the cubit at only 18 inches, it will be found that it must have been of the burden of 42,413 tons. A first-rate man of war, of 100 guns, is between 2200 and 2300 tons; and consequently the ark had the capacity of 18 of these ships, the largest in present use, and might carry 20,000 men, with provisions for six months, besides the weight of 1800 cannons, and of all military stores. It was then by much the largest ship ever built. Can we doubt of its being sufficient to contain eight persons, and about 200 or 250 pairs of quadrupeds? a number to which, according to Mr. Buffon, all the various distinct species may be reduced, together with all the subsistence necessary for a twelvemonth? The birds and reptiles would not, certainly, require very great additional space.

(b) Page 238.

Local circumstances may, however, greatly alter climates. Provence complains of much severer cold than it experienced some centuries ago. The reason is, that the forests formerly growing on the summits of the mountains being entirely destroyed, it is now more exposed to the north-east winds, descending without break from the Alps. In some of the high valleys of those mountains snows have accumulated from accidental hushes,
proceeding

proceeding from overloaded icy summits; and in such places an increase of cold is felt in the subjacent districts. It has been pretended that the glaciers of Switzerland have generally extended themselves; but their general extension is far from ascertained. When we were there some young men told us, that those of Grindelwald had much advanced within the last 15 years; but several old men assured us that they had seen them still more advanced into the plain 50 years ago than they are at present. A hot wind, which they call the Snow-eater, consumes more snow in eight days than does without it a whole summer's sun. I have been assured that they have been very much decreased since our journey thither. Years are not alike either in heat or cold, and much less amongst mountains; and consequently the increase or diminution of these snows is not permanent, but accidental.

(i) Page 239.

The Scythians, according to Herodotus, were, and reckoned themselves, a new nation. They computed only 1000 years from their first establishment on the banks of the Danube, or of the Boristhenes. These were husbandmen. The wandering tribes dwelt round the sea of Asuf, on the Don and Wolga, in the Cuban beyond Caucasus, on the northern and eastern borders of the Caspian sea. Those seated on the Boristhenes occupied no more than eleven days journey, or at most 80 leagues of country, towards the north. Beyond them they themselves said that the country was uninhabitable, from the quantity of feathers (snow) which fell from the heavens. The Greeks, indeed, talked of many nations, as the Hyperboreans, the Arimaspians, and the Anthropophages, to the north of the Scythians. Herodotus seems to give no credit to the fables told of these, but, from the informations he had received, believed that all was solitude beyond, both to the north and east. He was, no doubt, mistaken; but it was only in supposing absolutely null a very thin and scanty population. These northern regions probably had some inhabitants long before the date he here gives to the Scythian nation; but, as we shall hereafter shew, it is not improbable that before that date the lands they inhabited in his time were covered by the northern extension

of the Euxine sea, which both natural indications and antient records point out. Before that sea was diminished by the breaking down of its southern mounds on the Bosphorus of Thrace, they lived much higher up on the Boristhenes; but when more southern lands were uncovered, and the north grew colder by the dereliction of the sea, they came down the river, and became nearer neighbours to the Greeks and more polished nations of Asia. These snows and eight months of winter, which Herodotus describes in his time in their then country, which is the most southern part of Russian Ukraine and Tartary, and which are supposed to have been inhabited only 1000 years before the historian, and to be still very thinly peopled, by no means support the system of Mr. Bailly. To the east, except their short and late irruption into Media, they kept on the defensive against the Persians, in which they were favoured not by their numbers, but by the barrenness and difficulties of the country they inhabited.

(k) Page 240.

It was in 1218 that Jenghiz-Khan advanced against the sultan of Karasm. He was the conductor of the first great irruption of the northern nations into southern Asia. This conqueror, having caused himself to be acknowledged grand Khan of the Mongol Tartars, had already subdued all eastern Tartary inhabited by the Mantchoux, and had reunited to his dominions all western and northern Tartary now subject to Russia. In the time of this irruption Indostan was governed by several sovereigns, the most powerful of whom was the king of the Patans, the most northern nation of that country. The sultan of Karasm, of the family of the Seljukians, possessed part of Turkestan, all Transoxiana, and the best part of antient Parthia, called Iran and Irac Agemi, as also northern Persia, called Fars. The king of the greater Armenia paid tribute to him. Georgia had its independent princes. The calif Nasser reigned at Bagdat over Chaldea or Irac Araby, over part of Mesopotamia and the three Arabias. The Atabequite princes of Mousel, descendants of the great Nourradin, reigned over part of Syria and the remainder of Mesopotamia; the successors of Saladin held the rest of Syria
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and Egypt. It was then Almalkamel, nephew of Saladin. The sultans of Iconia of the third branch of the Seljukians were masters of Biladerfoum or Anatolia. The French had at that time seized Constantinople and the remains of the western empire. The dissensions of all these sovereigns favoured the conquests of this invader in Asia. In 1213 he invaded the seven provinces of northern China, then called Kitay, the emperor of which, called by the Mongols Alou-Khan, lost both his throne and life on this occasion. The generals of Jenghiz-Khan soon after added Kurje or Corea to his conquests; and he was preparing to add the country of Mangi or Matchin (southern China), then ruled by a distinct monarch, to his dominions, when death arrested him in the midst of his triumphs. His son Kublai-Khan pursued the enterprise, and was the first sovereign of all China. One hundred years after him Timur-Khan or Tamerlan, who pretended to be issued from him, pushed his conquests still further, and made himself master of Indostan.

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER III.

Examination of Testimonies adduced from antient Astronomy, to prove the Antiquity of the World ; and particularly of Mr. Bailly's second System, founded on an Indian Era pretended to be fixed on real Astronomical Observations.

WE have seen, Sir, the subterfuges by which some fragments of antient authors have been wrested, in order to prove an indefinite antiquity to the population of the earth ; and I flatter myself to have sufficiently demonstrated the futility and inadmissibility of these forced explications. Inwardly sensible of the weakness of such means, which solely consist in perverting the most evident sense of these traditions, and ashamed of laying much stress on the ridiculous pretensions of those nations who, to prolong their existence,

existence, have had recourse to imaginary beings, the favourers of the high antiquity of the world imagined they had at last found triumphant proofs of it in the pretended series of eclipses observed in China. But such astronomers as have attempted to verify them have uniformly agreed, that it was impossible to lay any solid foundation on observations of such early periods. They generally bear no other date but that of a reign : are never so precise as to mark the season of the year, or the place of observation ;—circumstances, however, absolutely necessary to fix the reality of such observations in a country so extensive as China. From the most learned researches they have concluded, that the real observations of the Chinese do not carry us so high as those which the Chaldeans are said, on more authentic testimonies, to have made (*a*). Besides, evident absurdities intermixed with these pretended observations, such as that of the sun being stationary during ten days, sufficiently shew what little regard is to be had to them. The as yet very narrow science of that nation, which, though it has carefully preserved the degree of knowledge it had once acquired, has been ever very little solicitous of acquiring further perfection, is ill calculated to inspire us with much confidence on these points (*b*). It is certain that, whether this nation was originally less learned in astronomy, or whether it has lost more of its former knowledge in its frequent revolutions, its principles in this science are less exact, notwithstanding its college of mathematicians, than those of its neighbours the Tartars, and still less so than those of Indostan.

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Reduced to abandon this so little solid support, it is towards these Indians that the partisans of high antiquity have lately turned their attention. Notwithstanding all the respect we may be inclined to pay to the certainly very antique race of the Bramins, we are forced to allow that the fables gravely retailed by them, on their origin and early history, are at least as extravagant as those of other nations who have set up equal pretensions. But it is asserted that astronomical calculations, founded upon real observations, assure to this people a pre-eminent antiquity, the proofs of which are thus rendered indubitable. We have already touched on the recent work of Mr. Bailly on Indian Astronomy, and we have drawn from it important lights in the discussion of several objects. We have seen that this judicious author, abandoning to pure fiction the years of the first and second Indian ages, has reduced to reasonable compass those of the third, in order to make it coincide with the duration of the antediluvian times, as gathered from other testimonies. Notwithstanding the propensity so natural to man to support an opinion once advanced, I cannot suppose that a person of his high reputation in science could have the smallest intention ever to measure back his steps, or to retract so formal a declaration, limiting the race of man to a period less than 6000 years before Christ, in order to revive the idea of a burning globe cooling by slow degrees, which, like that of Mr. de Buffon, would require a duration since the time of its being covered with waters, of 30,000, or indeed of 60,000 years. Before I examine the pretended era of 3101 years before Christ of the present

sent age, I must not dissemble that it is my opinion that neither of the three preceding ages really deserves a serious consideration. The two first are certainly fabulous ; and to the third, grounded no doubt on the original tradition of an antediluvian world, no calculation or reduction can be applied with any degree of confidence. As I have already indicated in a former note, the number of years attributed to these three ages, arithmetically decreasing, is visibly framed at pleasure by the combination of mystical and superstitious numbers, multiplied by one another, and really deserves no more attention than the prophetically determined period of the present age. The body of this last publication of Mr. Bailly, consecrated to establish the epoch of 3101 years before Christ, determined on real observations, is certainly a work equally learned and laborious. He therein calculates by diverse Indian tables and formulæ the positions of the sun, moon, and planets, at different periods, till he arrives at this principal era ; and verifies them nearly by the more perfect rules of our astronomy. Nothing can be more dazzling than this scientific display, nor more imposing than this kind of proof, which we are accustomed to look upon as demonstration. In mathematics a faulty basis, or the smallest error in initial cyphers, overturns at once the whole fabric of the most perfect calculations. I have no such reproach to make to Mr. Bailly, and am far from equal to contest these points with him. But here admitting the solidity of his basis, and the accuracy of his calculations, it is the conclusions drawn from these that are far from decisive. Without following the author in

operations far beyond common reach, this point may be discussed by simple reasoning.

What Mr. Bailly seems to have very clearly proved, is, that the antient inhabitants of Indostan have inherited from their ancestors tolerably perfect rules and formulæ for the calculation of the motions of the sun and planets, though they have lost all knowledge of the principles on which they are founded. He thinks that all the other nations of the east have borrowed from them their knowledge of astronomy, conveyed to them by the Bramins of the north; and that the first seat of primitive astronomy was between the 40th and 50th degree of latitude; and he seems inclined to fix it in Thibet or Boud-tan, though that country lies in a more southern latitude. This is recurring to his antient opinion of northern derivations, and is a matter of opinion. If the latitude of 40 is fixed upon, Armenia, under that same latitude, in which all oriental traditions place the cradle of mankind after the deluge, will have at least equal pretensions to it. It results from his verifications of Indian astronomy, and from the precious relics of that science which this author has discovered in all parts of Asia, that a sufficiently perfect theory of astronomy, drawn from one common source, has been antiently pretty generally diffused amongst the nations of the east, whose posterity has preserved its tables and methods, without understanding their principles. It is a most valuable work, containing the most curious discoveries, for which the learned world certainly owes great

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obligations

obligations to the author. If Mr. Bailly could have ascertained with sufficient evidence, that the era of 3101 is founded, not on retrograde calculations, but on real observations, he would have truly assured to the Indians the undoubted palm of the highest known antiquity, since we certainly have no other well authenticated observations which carry us by any means so high. But I will dare to say, that this essential point is by no means proved, but, on the contrary, remains as uncertain as before. The question is still to know, whether these Indians, antient or modern, have not calculated upon their tables backwards, as Mr. Bailly himself has done on these same tables, from some one known epoch, till they found by them a certain aspect of the heavens deemed sufficiently remarkable and proper to fix as an astronomical period, which they afterwards applied to their chronology. On this occasion it was to fix the beginning of a new age. I think the probability will be, that such has been the means of fixing it. The pretty just precision of these calculations will only serve to determine the value of their tables and methods of calculation. We know that the same tables which serve to predict the motions of the heavens for times to come, can also equally ascertain them for times past, however remote. If the present Indians, by a blind application of these rules on those tables, of the principles of which they are now entirely ignorant, are yet capable of predicting, with nearly just precision, the several eclipses and conjunctions of the planets for the future ; how much more easily might their ancestors, who had not yet lost the keys of this science, from any fixed date
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and well known position of the heavenly bodies determine what must have been their respective situations at any whatever anterior instant of time ! Mr. Bailly himself asserts, that the Indians reckon several of these astronomical epochs much more recent, to and from which they not unusually calculate ; such are those of the years 78, 499, (c) 638, 1282, and 1491, since the Christian era. One of these, or perhaps some one still more antient, may have served as a basis to ascend up to the year 3101 before Christ. He himself owns that the antient Indians had deduced, from calculation only, another era decidedly fictitious, rising to 20,400 years before this fourth age, in order to find in it the coincidence of the origin of their moveable zodiac with the equinox, and a conjunction of the sun and moon in this first point. He pretends, indeed, very gratuitously, that the Indians had taken for basis of this long, laborious calculation, the epoch of 3101 fixed upon real observations. To carry us thus back so many thousand years, it surely is of small consequence whence we start ; and these calculations will be comparatively little increased, though they should have had a basis less antient by some hundred years. The idea alone of thus making such long retrograde calculations, sufficiently proves a decided systematical aim of seeking singular aspects of the heavens, in order to make pretended earthly events coincide with them, and to give weight to the absurd fables of their mythology. The strong propensity of astronomers, who, like the Indians, are addicted to astrology, to imagine and look out for extraordinary affinities and influences between the heavens and

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and the role of the accounting system in providing reliable financial information. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods used to collect and analyze financial data, including the use of statistical techniques and the application of mathematical models. It highlights the importance of using appropriate methods to ensure the accuracy and reliability of the results.

3. The third part of the document discusses the challenges faced by organizations in managing their financial resources and the role of the accounting system in addressing these challenges. It emphasizes the need for effective financial management and the importance of using the accounting system to monitor and control financial performance.

4. The fourth part of the document discusses the role of the accounting system in providing financial information to management and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

5. The fifth part of the document discusses the role of the accounting system in providing financial information to external stakeholders and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

6. The sixth part of the document discusses the role of the accounting system in providing financial information to the public and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

7. The seventh part of the document discusses the role of the accounting system in providing financial information to the government and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

8. The eighth part of the document discusses the role of the accounting system in providing financial information to the media and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

9. The ninth part of the document discusses the role of the accounting system in providing financial information to the public and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

10. The tenth part of the document discusses the role of the accounting system in providing financial information to the public and the importance of using this information to make informed decisions. It emphasizes the need for accurate and timely financial information and the role of the accounting system in providing this information.

this era of 3101 years, the beginning of this age, was immediately preceded by an universal deluge.

I am no less persuaded than this astronomer, that this sublime science, which he so eminently possessed, really dates from very high antiquity. The long life of the antediluvian patriarchs must have given them a taste for the study as well as the means of perfecting themselves in the knowledge of the heavenly motions. The life of Noah and of his children, already possessed of that science, was sufficiently long after the deluge to enable them to continue it, and to rectify its tables and methods, if, as I am apt to believe, a change in the position and revolution of the earth required it. This correction, the necessity of which would be soon perceived, would no doubt demand the study and experience of many years; but when the base is once acquired, we know to what height one single happy genius is capable of carrying the most abstract sciences.

In the whole course of his work Mr. Bailly is much embarrassed to find a year of 360 days in use, as the measure of time amongst all the nations of high antiquity, serving as the base of the Indian ages, and a primary calculation every where to be corrected in their computations. This year, which is neither solar nor lunar, appears, as he thinks, the more singularly in these, as he pretends that the Indians were well acquainted with the nearly true solar year of more than 365 days before this era of 3101. This adoption of an error appears

pears to him so extraordinary, that he knows not how to account for it. This faulty year could not, continues he, exist in any nation for civil use; it must have then been purely fictitious, and a mere supposition of calculation. But why, may he be asked, should enlightened astronomers imagine and persist in making use of erroneous data, merely to have the pleasure of correcting them at every instant in their calculations? It is easy to imagine that the odd hours and minutes should make a separate calculation convenient; but in the first instance it was surely as easy to calculate from 365 as from 360 whole days. So singular a custom so universally adopted in early times, must however have been founded in some reason, and surely hides some mystery. It appears to me, that Mr. Court de Gibelin will furnish a very happy solution of this difficulty. That author, as respectable as learned, who has thrown so much light on all parts of antiquity, equally struck with this same singularity, gives an explication, which in my apprehension carries conviction with it. Before the deluge the earth ran through without deviation the 360 degrees of the equator in equal times; and that precise number of days, each of 24 exact hours, made up the true solar year, without any fraction. At the deluge this regular and natural motion was deranged, the course of the earth was diverged from the plan of the solar way, it became oblique, lengthened, variable and almost incalculable, and afforded no measure without fraction either to the year, the day, or the hour. This disorder was no doubt soon perceived after the deluge; but habit in the
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first patriarchs, and the respect still borne to antiquity, occasioned that, without changing the ancient year, it was endeavoured to supply its present deficiency by adding to the end of twelve months, of thirty days each, which constituted the antediluvian year, five days called Epagomenes; and this is signified by the Egyptians, who said that Mercury had won from the moon these five days in favour of Rhea. According to them, Mercury, one of their demi-gods, was the first who proved the necessity of adding them to the civil year. It was not however long before it was perceived, that this addition was insufficient; and it required the reiterated observations of succeeding astronomers to come to a nearer approximation, and the exact true year was not definitively determined till about 200 years ago.

The constant primary application of this year of 360 days to the Indian calculations is, I think, a very singular confirmation of Mr. Court's conjecture. The first calculation still constantly employed is that which was transmitted to them from the antediluvians, and which was the true and only one requisite for them; the second is the necessary correction to the first after the deluge and the derangement of the earth's motion, and is the result of observations made after that event. That by it they should approach so near to the truth as a few minutes, is a proof of the exactness of this correction. This process, which keeps these two calculations distinct, is certainly the longest, but very natural to the first authors of astronomy,

nomny, corrected after a change which rendered the first insufficient. It appears to me to be a striking and singular proof of the great antiquity of the first formula, which could only suit a different state of things, and no less so of a real change in the revolution of the earth, which had subsequently taken place, and necessitated this correction. This distinct employ of the antient formula, and of its correction, in the astronomical calculations of the Indians, becomes a true monument, confirming the opinion I have always had of the inclination of the poles taking place at that event. I had not hoped to find in the astronomical operations of that nation so direct a testimony of that great change in the economy of our globe. It is a new obliquity in the axis, and in the course of the earth, that this supplementary formula establishes, the reasons of which Mr. Bailly is so much at a loss to find. The near approximation to truth of the Indian year will prove, that that astronomy which the nation formerly possessed, but of which they now only retain the rules without comprehending the principles, was surprisingly correct, and probably of very antient date; but in no wise demonstrates that they were acquainted with the true year before the pretended era of 3101, being the commencement of the postdiluvian age. The correction constantly applied in their computations, not only of hours and minutes but of five whole days, tends on the contrary to shew a supplement to anterior knowledge.

From the remarks which I have laid before you, Sir, it will result that
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the astronomical observations of the Chaldeans, extending only to 2233 before Jesus Christ, cannot authorise a very high antiquity of the earth since the deluge, and that those of the Chinese are too vague and uncertain to be admitted. It will appear, in spite of the efforts of Mr. Bailly, that the calculations of the Indians up to their pretended era of 3101 cannot be proved founded on real observations; but have on the contrary every appearance of being retrograde deductions upon paper, like others avowedly of the same nature. Mr. Bailly will however have proved, that the Indians still existing as an unmixed nation, though generally subjected to foreign domination, have preserved with more integrity the practical rules of astronomy, which they as well as the other nations of the East had received from their common ancestors. Their mathematical formulæ attest still more irrefragably than the writings of historians the very antient use of a year of 360 precise days; which is no longer ours, but to which all nations were at some certain period obliged to add, in order to bring it to the actual revolution of the earth, five days, and afterwards several hours and minutes, according to the more or less exact precision of their astronomical observations. It appears that the Indians, like all other antient people, had the knowledge of an universal deluge, which began the present age, preceded by a more happy state of man, whose creation was posterior to that of other beings of a superior order. All these ideas are not particular to them. Bolder than other people, they have attempted to fix with precision the era of this deluge, and of the commencement of

our present age ; but it is far from sure that they have done it from real observations. It is much more probable, that, knowing the date of that event not to be very far distant, they sought, pursuant to their ideas of the influence of the planets, to determine it to the precise moment when by their tables they had found that an extraordinary conjunction of the sun and moon and most of the principal planets should, according to the rules of astronomy, have taken place. Their undertaking, by still more laborious calculations, to find out a still more extraordinary conjunction, in order to determine by it another celestial and terrestrial era, at the immense distance of more than 20,000 years beyond it, adds a further probability to the fictitious fixation of the first. Mr. Bailly is too learned and sagacious to attempt with them to give sanction and credit to the necessity of these celestial conjunctions to produce a deluge on this earth (the sole point universally agreed on), or to effect any other events amongst mankind at that or any other period. Though it should be allowed that the real observations of the Indians approach very nearly the time of that great event, and we shall readily agree that such observations were made very soon after it by the first fathers of that and of every other nation equally sprung from them, this singular conjunction of the celestial bodies, very important according to them, will only be proper to make us suspect that they had fixed its precise date rather upon this imaginary connection than upon real truth. We can only from thence conjecture, that this era, without being absolutely exact, is not perhaps very far from the true period to which
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tradition had vaguely fixed that memorable event. As we have before observed, the date the Indians give it will not exceed by many centuries the one I have allowed it, the Samaritan chronology by still fewer, and does not even attain the antiquity bestowed on it by the Septuagint. It will certainly be very far from authorising that prodigious number of ages required by modern philosophers, and which we must necessarily admit, to give time for the supposed hot and happy climate of the poles to cool by degrees, and, as the experience of more than 2000 years evinces, very imperceptibly, to their present cold temperature. Mr. Bailly has, not only unwarranted by the Indians, but in direct contradiction to them, added 400 years to their era of the deluge, seemingly for no other purpose than to carry that event beyond any version of scriptural chronology. From the few observations I have made, I think, Sir, that you will agree with me, that notwithstanding his labours it still remains at least doubtful whether any credit is to be given to the original Indian epoch of 3101 years before Christ, as founded on real observations. Their avowed retrograde calculations, to found on astrological principles a prior certainly fictitious era, afford the strongest suspicions that this last has been ascertained in a similar manner; and the singularity of the conjunctions of diverse planets equally incident to it gives additional force to this suspicion. The very remarkable circumstance in their processes of calculating first for 360, and separately for five more whole days, besides the additional calculations for hours and minutes in their year, certainly shews that the astronomical formulæ

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which they have inherited and blindly follow without understanding their principles, were originally framed either when 360 days was the true year, or before the additional number of days was found to be necessary. So perfect however are these formulæ, that it is difficult to suppose that their original constructors could err so very widely from the truth.

NOTES

NOTES AND ILLUSTRATIONS

TO

LETTER III.

(a) Page 262.

CALISTHENES sent to Aristotle a series of astronomical observations made by the Chaldeans, comprehending a space of 1903 years. It is possible that their numbers and antiquity may have been somewhat exaggerated; but the Chaldeans were seated very near the first abodes of man, and on the very spot where all mankind had been collected before the dispersion. They were less than any other people exposed to lose the principles of that science, which the long lives of the antediluvians invited them to cultivate, and afforded the means of bringing to perfection by the experience of centuries. At their first establishment the three patriarchs born before the deluge were still living, and men yet extended their existence to more than 400 years. Their climate was propitious, and the tower of Babel, though unfinished, offered them the first convenient observatory. According to my ideas, the dispersion of mankind took place in the year 2297 before Christ, and their earliest observations date in about 2233, or nearly about the time when Nimrod, expelling Assur, may be supposed to have taken possession of that country. The Egyptians claimed the exclusive right to first antiquity and to the invention of all sciences, and thence pretended that the Chaldeans had many ages after derived from them their knowledge in astronomy. These observations

vations shew at least the falsity of these assertions. Cham and his descendants, who travelled southward, were probably not ignorant of its principles; but as Egypt, excepting Libya, was the last settled country of his inheritance, observations could not have been made there so soon as in Chaldea: nor do we find in antiquity any such continued series of observations certified amongst them.

(b) Page 262.

Little stress can be laid on the antient knowledge of the Chinese in astronomy, as facts prove that they are yet at this day very little advanced in it. In the beginning of this century the whole tribunal of mathematicians were incapable of calculating an eclipse with any degree of precision. The then emperor caused their chief to be beheaded, and found it necessary to recall the jesuits, lately expelled and still resident at Macao, to compile their almanacks; an object of great importance to a nation so addicted to judicial astrology. As since the extinction of that order few learned missionaries go into China, the present reigning emperor sent orders to Canton in 1778 to ask artists of various kinds, but particularly astronomers, from all the European nations.

Mr. Playfair observes, that it is recorded in the Chinese annals, that in the reign of Chong-tang the mathematicians Hi and Ho were punished, according to a law of the emperor Yu, for not having predicted an eclipse of the sun, which happened in the year 2159 before Christ. But though this eclipse, which did not exceed one digit at Peking, is there said to have alarmed the whole nation, and to have occasioned the death of its principal mathematicians; yet their successors, uncorrected by this severity, totally neglected recording any other eclipse for the space of 1312 years, as the next mentioned dates no higher than 776 years before Christ. From this we may reasonably infer, that the former pretended observations and records are spurious. As this observation of an eclipse corresponds with the era of the first olympiad, and nearly with that of Nabonassar, periods when the science of astronomy was much perfected, it is not improbable that
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the Chinese, receiving new lights from the more western parts of Asia, might about the same time begin to record a more perfect series of celestial observations. At that time northern China was still in a divided state, and its southern provinces yet barbarous. 400 years after it all its original records were destroyed; and when again endeavoured to be restored by succeeding men of learning, it is probable they would have recourse to their neighbours for such observations as might tend to give order to the scattered remnants of history and science.

(c) Page 267.

Certain it is now from the recent researches made by the authors of the *Dissertations* relating to the antiquities of Asia, that it was in this very year 499 after Christ, that the date of the present Indian age was fixed. In that year their most celebrated astronomer found by observations, that the vernal equinox coincided with the origin of their ecliptic. Imagining, in consequence of their theory, that it must have had the same position 3,600 years before, he thence, according to their astrological ideas of regulating all sublunary things by the position of the heavens, determined that epoch as the undoubted era of the Caliyuga. From that supposition alone it is now so fixed by the Hindus. Such are the grounds on which Mr. Bailly has thought proper to assert the actual observations of the Indians carried so far back as the year 3101 before Christ: for this purpose he filled a whole quarto volume with retrograde calculations, which he had been at the pains of making, both on the Indian formulæ, and according to the rules of our astronomy. The almost perfect agreement of their results shews indeed the very near approach to truth of the rules and tables of the Hindus, though they are perfectly ignorant of their principles, and even of the figure of the earth. Nearly the same rules, with the same ignorance of principles, have been preserved in Tartary and in China. This laborious work of Mr. Bailly shews with what industry infidels catch at the slenderest threads to invalidate the authority of scripture. In order to raise the age of the world since the deluge, beyond the reach of even the Septuagint version, he

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has, in defiance of his own favourite Indian authority, added their interval of 400 years between their third and fourth age to the sum of the present age. It should seem, that a similar motive has engaged him to prolong the former age by those same 400 years. From the above-mentioned dissertations it appears, that the origin of Indian history cannot be carried higher than about 2029 years before Christ, and that the appearance of Buddha must be at farthest dated 1027 years before our era.

THOUGHTS

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER IV.

Remarks on the Monuments of Nature alleged as Proofs of the Antiquity of the Earth.—Reflections on the System of Mr. de Buffon, and of divers other modern Philosophers.

UNDER the specious pretext of the obscurity and uncertainty of antient story, and confounding in their scepticism particular and isolated facts, invented by the interest of priests or imagined by the vanity of this or that people, with those great events which belong to the whole human race, and whose essential and fundamental points are attested by all nations, several persons think they have a right to reject all historical testimony. It is Nature alone, say they, who must be interrogated on her age. A considerable number of modern naturalists affirm, that the vestiges and monuments of that

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Nature, much more authentic than the dubious records of history, loudly proclaim a much higher antiquity. In vain do the traditions of all nations assert the event of an universal deluge, whose date is not very far removed; in vain do they disclose the cradle and infancy of the most antient nations, and the first population of more than three parts of the earth as yet recent: against all these testimonies they set the irrefragable authority of that book whose characters are manifest to their sagacity. This globe has, no doubt, say they, undergone many revolutions; but that recent deluge of which so many nations speak was neither general, nor worthy to be ranked amongst the great epochs of nature, the latest of which must at least be removed 100 centuries before our times. That deluge recorded in our scriptures Mr. de Buffon terms the particular and casual inundation of Armenia, equally partial and local as those spoken of by the Greeks and Egyptians. It must be allowed that, was the voice of nature clear and precise, an undoubted preference would be due to it above traditions, which, however universal, are tinged by great confusion and many variable circumstances. But nothing as yet clearly indicates the authenticity of that voice; it is the versatile language of its pretended interpreters, always in contradiction with one another, and often with themselves, which I hear. Avowing the rapid progress of natural philosophy in many parts, I have yet strong reasons to doubt whether it is sufficiently advanced to pronounce without appeal on the whole system and order of nature. Many very celebrated naturalists agree, however, in maintaining
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that the most certain indications of nature prove a much more ancient existence of the present earth than is given to it by common opinion and vulgar prejudices ; and that the very construction of this globe announces many thousand years more, since the possibility of any universal deluge, than can at any rate be made to coincide with the relation of Moses ; and that every part of it is incompatible with his account of the creation, calculated, say they, to suit the ideas of an ignorant people, and nowise worthy to be the guide of philosophers. We ought, no doubt, to hear them : but, notwithstanding the authority of great names, it will be lawful to examine if this their decision is in truth irrevocable ; and if it may not perhaps be yet possible to explain the present order of things, without absolutely contradicting the few words left us on that head, as the general tradition of his times, by the oldest and most respectable of historians (*a*). It will not be less useful perhaps to consider, if the systems which have been substituted to his plain narration are in fact more consonant to the few well known laws of Nature, or to its more generally averred operations. I will own to you, Sir, that the principles of these philosophers often appear to me rather founded in their own bold and brilliant imaginations than in Nature. If they have often happy coincidences with her, it must be allowed that sometimes it is not Nature which presses the system upon us, but the system which forcibly bends her to its gratuitous decisions.

The ambition of framing general systems tyrannises the most sober

heads, and attaches us to certain ideas, to which, without perceiving it, we strive to make all Nature pay homage, even where she is most stubbornly opposite. How many pretended experimental discoveries have we seen, which could never be repeated by others! How many assertions are hazarded upon the partial inspection of one country, which are falsified by the examination of another! How many spurious or incorrect accounts (*b*) have been eagerly adopted without scrutiny, because they were favourable to the particular system embraced! These are weaknesses natural and common to all those who support with warmth any opinion once imbibed. Amongst the French philosophers in particular, over and above the common vanity of important discovery, and of dealing out laws as second creators of the universe, another motive has in general had no small influence. Many of them have been avowedly combined to overturn by all possible means, each in his distinct department, not the particular mode adopted in France, but the general foundations of christianity itself, which in many points seemed to cramp their genius, and set bounds to that human wisdom of which they have, or think they have, so large a share. To set nature at variance with the assertions of one of its first props, and with a supposed inspired writer, was no small object. The short account he has given us of the creation runs counter to the opinions said to be framed on the unerring proofs of Nature by many celebrated philosophers; and has not yet been so satisfactorily explained as not to meet with some undeniable objections. Notwithstanding my feeble

efforts to pave the way to a more satisfactory explanation, the object will no doubt by many be deemed not only unattained, but every part of my reasoning inadequate to command the conviction they require. To time, and the more successful labours of men of superior talents and knowledge, who may hereafter deign to follow the track I have ventured to point out, I must leave this. But before I enter into this discussion, it will be proper to lay before you, Sir, and to examine with you, those more celebrated modern systems in particular which have been triumphantly substituted to the Mosaic narrative; and to consider whether these are, in fact, more intelligible and more conformable to the known laws of Nature, than that account, however short and obscure. You with justice require me to give my reasons for dissenting from systems supported by the blaze of celebrated names, and sanctioned by the number of their proselytes. To Mr. de Buffon's system to which you, Sir, are more particularly attached, I shall expose my objections more at length. In fact, most other systems since him are nearly established on the same general foundations.

In his Introduction to the History of Animals Mr. de Buffon, already distinguished in the learned world, after having briefly exposed and refuted the several systems of Woodward, Whiston, and Burnet, gave to the world a new Theory of the Earth. Amongst his countrymen the sublimity and eloquence of his style gained him many admirers, disposed to give credit to the ideas of a philosopher who promised to
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do great honour to his nation. The learned of other nations passed it over as the licensed flight of a great genius. Having gained very deserved reputation by the accuracy of his descriptions of the forms, and his sagacious disquisitions on the nature and manners of that multiplicity of quadrupeds, birds, and fishes he had treated; he, after more than twenty years interval, again came forward, no longer to give a bold conjecture on the formation and theory of the universe, but, with pretended proofs in hand, to evince not only the possibility, but on most points the necessary truth, of his former assertions. This was no longer in the style of a man who offers his ideas and conjectures to the world, but in the magisterial and dictatorial tone of one who is perfectly sure of whatever he advances. Already highly prejudiced in his favour, his countrymen very generally received his dictates with implicit faith; and many learned men of other nations, who had imbibed the unbelieving principles of French philosophy, adopted great part of his system, as fully sufficient to overturn at least all prejudices grounded on the Mosaical and scriptural account of the creation and of time. I must first lay before you, Sir, a summary view of the system itself, before I offer those objections to it which to me seem unanswerable. I have to combat, with unequal arms, a genius of high reputation and of superior eloquence: to neither of these can I pretend; but I trust to the naked force of fair reasoning.

In this celebrated system fire is the principal, or rather sole agent.

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In our planetary world it is in the sun that it essentially exists. That immense globe is a mass of vitreous matter in fusion, kept in strong and perpetual motion, first by the pressure of the comets, which he supposes to amount to between 400 and 500, and at least to 115, and afterwards accelerated by the additional pressure of the planets gravitating on it. It is not said whether our sun and the stars, the suns of other systems, were originally created, or whether they existed from all eternity. After making rather an excuse to, than paying homage to the popular prejudice of an intelligent Supreme Architect—in the whole course of his reasoning, plastic Nature is aimed to be shewn self-sufficient. In the moment in which Mr. de Buffon takes up his regular narration, a comet falling obliquely with immense force and velocity into the sun, carries off with it a portion of its exterior limb, amounting to about an eight hundredth part of his whole mass. This inflamed matter, combined with that of the comet itself, was dispersed and thrown by the shock to immense distances. The impulsion in a straight line, less efficient on the weightier parts first attracted to each other, soon formed the mass of those planets nearer to the sun; whilst the lighter parts, in proportion to their specific gravities, were by the same force thrown to much greater distances, to form the more distant orbs. This projectile motion, gradually weakened by the attraction of the sun, was at last arrested by its force. The planets, preserving a rotation round their axes, were by its power constrained to move in a circle, each in its present orbit, but in the same plane, round that primary body. The vivacity of the inter-

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nal motion, of the fire and brightness of the sun, was then increased by the additional pressure of these new-formed planets, acting upon it as the spokes of a wheel upon the axle-tree. The whole matter of all these projected planets was composed of liquid glass, surrounded by an atmosphere of watery vapours, such as still encompasses their parent sun. Not having the same pressure, they preserved not, at the distance they were thrown, their original internal motion and heat; but gradually cooled, and became consolidated in proportion to their densities and diameters. Their surfaces were first cooled, and their whole masses progressively towards the centre, till at last they shall lose all heat, and become dead, and incapable of sustaining vegetable or animal life. From the analogy of the time required to cool a red-hot cannon ball, our author has ventured to fix the times in which each planet ceased to be red-hot on its surface, and those in which they will finally lose their central heat. The duration of incandescence, or of their retaining a red-hot surface, lasted till each planet became consolidated to its centre; and is thus determined: 2936 years for the Earth, 644 for the Moon, 2127 for Mercury, 1130 for Mars, 3596 for Venus, 5140 for Saturn, and 9433 years for Jupiter. By the same rule, the time of each becoming habitable, and that of each finally losing all heat, are fixed. The Moon has long become frigid, and Jupiter is not yet sufficiently cooled to bear animal life. The Moon, the satellites of Jupiter and Saturn, formed from the less dense particles of ~~the~~ planets, were projected from their equators in the time of their ebullition by the centrifugal force of these planets, proportional

proportional to the velocity of their several rotations. For want of this velocity Mars has no satellite, Mercury probably has none, but Venus might have one imperceptible to us, though such projection may have been prevented by the extreme density and adherence of its substance. In his epochs of Nature Mr. de Buffon modestly declines absolutely determining that the formation of the planets was necessarily owing to the action of this comet skimming and carrying off with it part of the surface of the sun. But he asserts that it is both possible and probable that this was the case; and maintains, as a very probable hypothesis, that a comet, which in its perihelium should approach near enough to the sun to raise and plough its surface, might produce such effects; and that it is far from impossible that some day new planets should be formed in this same manner; all of which would circulate, like the present planets, in the same direction, and nearly in the same plane round the sun. Such planets would turn upon their own axes, and their substance emerging from the sun in a state of liquefaction would obey the same centrifugal force, would be in like manner elevated towards the equator, and depressed towards the poles; they might also have their satellites, become gradually cool, and finally peopled in the same manner as the present planets. Thus we see, without any, or at least any new interference of the Godhead, a new fund prepared for the formation of new worlds, and new inhabitants, to all eternity. But to return: He conjectures that this and all other comets of our planetary system, whether equally beneficently active or inactive,

were originally formed by the explosion of a fixed star, the nearest to our sun, whose parts, thus dispersed, having no longer any common centre, were forced to obey the attractive force of our sun, who from that instant became the focus and pivot of all our comets. Though he does not assert the agency of this creative comet absolutely certain, yet he maintains positively, that all our planets are composed of the same materials as the sun, and are, probably, by some such accident, detached portions of that body. All our planets, though of different densities, are entirely composed of melted glass, and consequently all earthly matter, without exception, is vitreous. This truly hermaphroditical glass is at the same time the seed and matrix of all that exists upon the planets, of all possible beings, animated or inanimate. It seems early to have produced air and water, by sublimation, as it had produced fire by friction; and those elements accompanied our planets as minor captives robbed from the sun's atmosphere. Whilst our planet continued in the state of incandescence, these were kept aloof for the space of 2936 years: but when this interior heat was diminished, and our globe became consolidated to the centre; these elements, which cannot support a temperature so hot as was till then the surface of the earth, began to make successful inroads on its cooling surface. They fell upon it, but were often yet repelled. At last the waters fixed upon the coolest parts of it, towards the poles; and this might happen about 25,000 years after its first formation. During this first epoch of Nature, matter became more and more fixed and compressed, so as to
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form the whole solid basis of the Earth, and of the highest mountains of vitreous rock, such as we see it at present. The first asperities and cracks on the surface were the effect of gradual cooling from the red-hot state, during the first epoch; and these were greatly increased in the second, by the final cooling to the degree necessary for waters to fix upon the most elevated heights under the poles, where heat was soonest evaporated, and possibly on the highest equatorial mountains. It was also during this first period, and the subsequent 12,000 years, that the great veins of metals were formed. The primordial metallic veins were formed by fusion and sublimation only, in the perpendicular crevices of the first high mountains. Gold and silver, especially when found in their native form, and in vitreous rocks in the highest mountains, are to be reckoned amongst these (*c*). The secondary mines of gold and silver, in inferior situations, and often in horizontal positions, and also most other metals found in a mineralised state, were lodged there by the additional intervention of waters. The reason why fewer gold and silver mines are found in the north, is because the mountains of those regions are generally lower. During the same time that the action of fire, and the effects of refrigeration and consolidation, produced the first great eminences, these same causes formed ebullitions or bubbles, covering great vallies and cavities under the exterior coat. But both these primitive eminences and cavities underwent great alterations by the subsequent workings of the waters when these became established upon the earth; and the highest mountains of vitreous rock are the

only monuments remaining of the first skeleton of the globe. These, and the interior rock of the earth, owe their origin to fire alone. Whilst the whole terrestrial substance was in fusion, matter ran from the two poles to elevate the equator; and in consequence, the highest eminences, the greatest depths, and the deepest subterraneous cavities, are there to be found; but it seems that the arctic circle furnished more than the antarctic.

At the end of 30 or 35,000 years, beginning the third epoch of Nature, the Earth was sufficiently cooled to retain the waters. At this time not only the waters, but all volatile substances, hitherto kept suspended by too violent heat, fell upon the earth, filled all its depths and cavities, and covered all its eminences (excepting perhaps some of the most elevated), at least to the height of 1500 toises, under which are still found deposits of shells and marine productions. The first fall of the waters and other volatilized substances upon the earth yet heated, produced violent agitations and tempests, and during this epoch almost totally changed the first surface of the earth. Agitated by the action of the sun and moon, now first apparent, and the violence of winds, they overthrew many points of its eminences, broke through the chain of its mountains in the weakest points, deepened its vallies in other parts, undermined the vaults of its caverns, filling them, and opening new passages to still more subterraneous cavities. By these last efforts the level of the waters kept gradually sinking from its first level of 2000 toises above the general surface of the globe.

globe. The mass of waters seized on all those substances which it could dissolve, and combined itself with air, earth, and fire, to form acids, salts, &c. ; it converted the broken and pulverized scoria of primitive glass into argillaceous earths ; by its motion it transported all these new substances from place to place. During the period between 35,000 and 50,000 years after the first formation, by breaking down and filtering into the great cavities and caverns of the earth, the almost universal sea which covered the globe gradually sunk down to its present level. During this space the waters produced infinite generations of shell-fish, and of other aquatic animals, many of whose species, capable only of subsisting in a degree of heat now subsided, are no longer to be found alive. Great deposits of the exuviae of all these, and many others, are to be found buried under the whole surface of the earth, and as high as 1,500 toises above the level of the present seas. Whilst Nature fecundated the water, she at the same time spread the principles of life both over those lands which the sea had never covered, and those which it successively abandoned ; every part of the earth emerged from the waters was covered with trees and vegetables of luxuriant growth. To these, floated and deposited by the waters, all slates, coals, and bituminous substances owe their origin. The shell-fish of this period having prodigiously multiplied during 20,000 years, these, and all those aquatic animals who have the faculty of converting sea-water into stone, left, after their short lives, immense deposits of their exuviae, to be triturated and transported from place to place by the waters ; and thus formed the regular layers of calcareous earths, covering the
6. clays.

clays already formed, or forming, by the combination of water, salts and acids with the dust and sands of vitreous rock, mixed as well as those with shells in a more or less perfect state, and often enclosing other kinds of fish. In these times began the motions of tides and regular winds: these, and the waters more or less confined by rising lands, produced currents. The currents gave to the lesser hills, now forming, correspondent directions, and scooped out the vallies with corresponding angles. To this period must be referred the deposition of secondary metallic mines, the formation of all argillaceous earth, and the birth of the first shell-fish and vegetables, origin of all calcareous substances, of coals, and bitumens. In this time all the immense quantities of these new substances were deposited in regular strata, horizontal or inclined, according to the first basis, by the flux and re-flux and various agitations of the waters; whilst new currents gave direction to these accumulating mounds, or, by forcing a passage through those already formed, excavated the vallies. Our author thinks the time he has allowed barely sufficient for all these operations.

The decomposition of the immense quantities of vegetable substances deposited at various depths by the waters during the foregoing period, produced sulphurs and bitumens. The electric matter proceeding from the interior heat of the earth, fire, air, and water, combining with these, produced subterraneous thunders and earthquakes, which frequently rent the caverns of the earth, and, producing great changes on the surface, contributed to lower the level
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of the waters. But the first volcanos appeared not till the fourth epoch, 50,000 years after the formation, first bursting from the highest mountains surrounded by waters, and by degrees in inferior parts as the waters sunk beneath them, but before they had entirely left their vicinity. These volcanos breaking out in all parts, in those even where they have long entirely ceased, during this whole period of 10,000 years, greatly altered the earth by their ravages, rending it in some places, and throwing up new mountains in others, and spreading over the surface great quantities of volcanic matter, formed by mixtures of all the former substances vitrified afresh by the action of fire.

When these terrible convulsions had in great part subsided, the first elephants and larger terrestrial animals were produced, in the fifth epoch, on those parts of the earth which were now sufficiently cool to receive them; that is, under the poles, where the central heat had sooner evaporated.—Here we must stop a while to give an account of the most curious part of our author's system, the perfect intelligence of which I must leave to more sagacious heads, as I own it entirely passes my conception. I shall therefore collect it from the author's words. ●

All organized nature, plants, fish, animals, and men, owe their primary existence to an infinity of living organical atoms, or molecules, every where floating, and to certain interior forms or matrices (*moules intérieures*), ready to receive and absorb them. If
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these produce not now new organised beings, it is because there is already a sufficient number of existing beings to receive and absorb them. All production, all generation, all development and growth suppose the concurrence and reunion of a great quantity of these organical atoms; they animate all organised bodies, and are successively employed for the nourishment and generation of all beings. Should a great part of these beings who now absorb them be suddenly suppressed, we should see new species appear, because these organical atoms, indestructible and ever active, would in that case reunite to compose other organised bodies; but when entirely absorbed by the interior forms of already existing beings, no new species can be formed, at least in the first great classes of nature. In the formation of man, doubtless not to shock too violently vulgar prejudices, he allows a particular interference of the Divinity, who imparted to him that intelligent spirit which renders him so superior to other animals. He insinuates, however, that from analogy this might be dispensed with, and that with respect to his body the common law of animal production was followed.

Having thus briefly exposed that mechanism of Nature by which, according to our author, not only all vegetation, but all aquatic and terrestrial animals were produced, let us return to the particular facts which mark this epoch, which lasted 5000 years.

It required 60,000 years after the first formation, before any part
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of this earth was sufficiently cooled to suffer the existence of terrestrial animal life. The first parts of it which obtained that requisite temperature were the polar circles, on account of the lesser diameter of the earth, and the less intense heat of the sun. In our hemisphere, our author conjectures that 60 degrees of latitude north, as under it lie the most elevated parts of those regions, first saw the production of terrestrial animals. These were the elephant, hippopotamus, and another species of still greater magnitude, now lost: the two first can now live only in the equatorial regions. But these, their first prototypes, the productions of nature in her fullest vigour, were much larger than any now existing in those southern countries. This is proved by the quantities of bones of the elephant and hippopotamus, and of that still larger unknown animal, dug up in many parts of Siberia and Canada. Probably they may be found in the mountainous parts of Lapland. The present habitations of these animals under the equator were yet too burning hot to receive them, or perhaps even to permit the permanent resting of the waters on those parts. To the polar regions they were yet confined; and there these animals, of a size and strength now unknown, lived and multiplied exceedingly during this whole period of 5000 years. It was not till after it that, these parts becoming gradually too cold, they successively removed to the 50th, 40th, and 30th degrees of latitude; and it was not till after the lapse of about 10,000 years that they at length took refuge under the equator, and 20 degrees on each side of it, where at present are the natural habitations of an inferior

race. The time of their existence in the north was prior to the separation of the American continent from ours. In the New World, after that event, the whole race perished, because the mountains of Panama, where the cold is too great, suffered them not to reach the equator as in our continent : and hence, though the exuvizæ of these enormous animals are equally to be found in north America as in northern Europe and Asia, no remnants of them are to be traced in the southern parts of that continent. Hence too the warmest climes of it produce only animals of posterior production, and of inferior size. Those animals, on the contrary, which populate cold and temperate climates, are equally found on both continents, and equally preserve their races in them. These were later productions of less vigorous nature. The rein-deer are the last of these ; and who knows, says he, in the succession of time, when the regions wherein they now live become much colder, if other animals may not be produced hereafter, whose temperament shall differ as much from that of the rein-deer, as the nature of this last is different in that respect from that of the elephant ? In our continent, says our author, no new animals were produced under the equator. The large animals, whose nature is congenial to heat, had multiplied exceedingly in the north ; and, when driven from thence by cold, took refuge in great numbers in its equatorial climates : there they instantly absorbed all the living organical atoms, and left no superfluous ones to form new species. The larger animals not having been able, from the reasons already mentioned, to penetrate into

southern America, these atoms not being absorbed by the interior forms of any living animal, produced new and totally distinct beings, which, in the decay of nature, attained neither the size nor strength of those which were derived from the more prolific north at a time when nature furnished a greater abundance of this animating organical matter. The reason of this greater abundance at that epoch in the northern regions is evident to Mr. de Buffon. All those aqueous, oily, and ductile particles, which enter into the composition of organised beings, fell with the waters, both sooner and in greater quantities, upon the northern than on any other parts of the earth. It was on these aqueous and ductile particles that the organical living atoms first exercised their powers to model and develop organised bodies; and as these organical atoms are only produced by heat, on this ductile matter, they were more abundant in the north than in the south, where this same matter fell in less quantity. Hence it is not to be wondered that the first, the strongest, and the largest productions of animated nature existed in these northern lands; whilst under the equator, and particularly in southern America, where the quantity of ductile matter was much less, inferior, weaker and smaller species were formed. At the time when elephants inhabited our northern regions, those trees and plants which now only grow in southern climes, covered the surface of the north. The monuments of nature declare it; for all the impressions of plants which are found in our slates and coals, represent those only which now exist exclusively in the Indies, or more southern

parts. It may be objected, says he, that trees and plants cannot travel like animals ; but they may sow themselves progressively in congenial soils, and may thus have been transplanted from the poles to the equator, whilst their prototypes perished in the north from increasing cold. But this successive transplantation of woods is not necessary, adds he, to account for the present existence of these vegetables in the south ; for the same degree of heat produces everywhere the same plants without transplanting. From the discovery of the above curious mechanism of procreative nature, our author had already peopled the globe with living animals, and we now see him producing plants without seed or slip from the more simple operation of plastic heat. Whatever relates to these organical atoms, and interior forms or models, I have here given, as nearly as possible, in Mr. de Buffon's own words, to be found in the ninth volume of his Supplement to Natural History. If this singular part of his system is not clearly understood, it will not, therefore, be my fault.

Great and solid reasons, pursues our author, combine to prove that the formation of man was the last great work of nature. It may be said, that analogy seems to demonstrate that the human species followed the same steps and dates from the same time as other species ; and that, if the epoch of his creation is posterior to that of animals, nothing proves that man did not undergo the same laws of nature, the same alterations and changes. We will agree, says he, that

that the human species does not essentially differ from other species by its corporal faculties; and that, in that respect, its origin may have been the same with that of other animals: but can we doubt a great difference between man and other animals proceeding from that divine ray which it has pleased the Supreme Being to impart to him? The superior faculties of man enabled him to guard himself against cold, but he has no means of preserving himself against heat; and he is unable to bear a degree of that which is even congenial to some other animals. Independently then of scripture authority, we may pronounce that man was formed the last of animals, and in the north, where first was found a temperature proper for his existence. The history of his first race is reserved to the seventh epoch.

The separation of the two great continents happened in the sixth epoch, about 10,000 years ago. It was posterior to that period when elephants inhabited the northern regions, since it appears that their species existed originally at the same time in America as well as in Europe and Asia. This is proved by the exuvix of those animals, though no longer existing there, which are equally found in the northern parts of the new continent. This separation was effected by the sinking of great tracts of land to the east and west of our continent, the space of which was filled up by the waters. This depression of the land was more considerable towards the southern pole, because the first great current and motion of the waters was from north to south. This impetuous current shaped the southern parts.

parts of both continents into points. So long as the waters continued falling upon this earth, this motion of the sea from north to south prevailed alone; but when these were fallen, and the sun and moon began to act upon the earth, this was succeeded by a strong motion from east to west. Its influence was little less considerable; it accumulated the mountains towards all western coasts; and when the waters began to settle, running with violence from those heights they worked the shores beneath into abrupts and precipices, by their precipitate fall, in the same manner as we see a cataract despoiling the rocks of their soil, and scooping out the earth below. The first beginning of the separation of the two continents our author conjectures to have taken place in the Pacific sea, whose numerous islands from north to south are the broken remnants of vast tracts of land sunken and swallowed up by that ocean. The sinking of the great Atlantic island, spoken of by the Egyptians, produced the great chasm between Africa, Spain, and the opposite American shores. But this, as man has preserved some tradition of the event, he imagines to have happened much later. Last of all was made the separation between Greenland and Norway; but whether the separation of that country from Europe still farther north is perfect and complete, he doubts. It was during this epoch also, that England was separated from France, Ireland from England, Sicily from Italy, Sardinia from Corsica, and both of these from Africa. It was probable also at this time, or shortly after, that Cuba, St. Domingo, and the Antilla islands were torn from America. In consequence of these concussions,

concussions, the freights of Gibraltar, and of the Bosphorus of Thrace, were opened. Before this happened, Lac Aral, the Caspian and Black seas formed one great interior sea, whilst the Mediterranean was yet a lake of inconsiderable extent; but by the rupture of the Bosphorus it was greatly enlarged by the pouring in of the waters of the Black sea; and by this inundation as much land was lost, and great part of it for ever, in Europe and Africa, as was gained in Asia by the reduction of the waters of the Black and Caspian seas. This was the first great deluge in those parts of the world. A second happened when the gates of the freights of Gibraltar were thrown open by some earthquake, or the undermining force of the Atlantic, which let in the waters of the ocean, laid under water still more considerable parts of the former continents of Europe and Africa, and still further increased the extent of the Mediterranean sea. The separation of the continents, and those deluges occasioned by the rupture of these freights, appear to have been of much earlier date than any of those preserved in the traditions of men. That of Deucalion dates only about 1500 years before Christ, and that of Ogyges about 1800. These were only partial inundations, ravaging the lands of Thessalia or Attica, occasioned by some earthquake heaving up the neighbouring seas to flow upon these lands for a short time. The deluges of Armenia and Egypt, the memory of which was preserved by the Hebrews and Egyptians, though about five centuries more antient than that of Ogyges, is still without comparison more recent than those times when elephants inhabited the north ;
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since in the most antient records we are told, that ivory was drawn from southern countries, and, consequently, that those animals had already emigrated to those countries where they now live, above 3000 years ago. These three deluges therefore, however memorable, must be looked upon merely as local and transitory inundations, and are not to be compared, either as to extent or antiquity, to those former deluges which laid such vast tracts between the two continents, and such extensive lands round the small lake of the now Mediterranean sea, under water for ever. These events, though posterior to the establishment of terrestrial animals in the north, probably preceded their arrival in the equatorial regions; and the gradual emigration of elephants from Siberia to their present countries, long too hot for the residence of animal life, took up a space of 10,000 years. Since the separation of the continents, and the rupture of the freights, the sea has rather gained than lost upon the land. Independently of the acquisitions of lands in Asia, around the Black and Caspian seas, and the lake of Aral, all great rivers have gradually formed islands at their mouths: the Nile has formed the Delta, the river Amour a great island in the Tartarian sea, the Mississippi a great part of Louisiana, and the river Amazon and other great rivers in America the extensive tracts of Guiana, great parts of which are yet scarcely to be called land. A giant race, long extirpated in Asia by the extreme population of men of ordinary size, still exists in some parts of southern America. But in proportion as men have multiplied in those climates, which are
now

now temperate or warm, the human race has gradually diminished by the increasing cold in those northern parts where it originally flourished. The polar regions are no doubt entirely frozen, and the circuit and extent of ice daily augments, and will augment till it shall progressively advance to the equator itself, and thus render the whole globe incapable of bearing either animal or vegetable life. This, by his calculation of its progression, will happen in about 89,000 years: and this nearly accords with those calculations formed on the laws of refrigeration, by which our learned author had already fixed that final death of nature at the period of 93,000 years from the present moment. The ice has, and will gain much faster from the antarctic than from the arctic pole, because it has less land and more sea (*d*).

Thus have I, says Mr. de Buffon, descended in the scale of time, from the first issuing of this globe from its parent sun, to ages not very far removed from ours. The state of incandescence, and the time which was necessary to cool the earth sufficiently to receive the waters, lasted about 25,000 years: 10,000 years more were required for the total fall of the waters. In the third epoch an universal sea covered the earth; the first testaceous fish and the first vegetables were produced; the surface of the earth was covered with horizontal beds: and these works took from 15,000 to 20,000 years. Towards the end of the third, and the beginning of the fourth epoch, the waters began to retire, the currents of the sea fashioned out vallies, and subterraneous fires began to ravage the earth.

their explosions. These motions lasted 10,000 years; and, upon the whole, all these operations took up a succession of 60,000 years. In the fifth epoch Nature, in her first moment of repose, brought forth her noblest productions; terrestrial animals were generated; and in the sixth epoch the great changes, operated by the separation of the continents, took place, 70,000 years after the formation of the earth. This brings us to about 5000 years before our present times, distant about 75,000 years from the first existence of this globe; from which, to the final extinction of productive nature, Mr. de Buffon computes 172,000 years. Nature is already dead in some of the planets, as in the Moon. We are not told what is to become of all those useless orbs, when in process of time she shall be equally extinguished in all.

In the seventh and last epoch our author places the period when the powers of man began to second those of nature. No longer terrified by those frequent convulsions of nature, which, till then, every where threatened him with destruction, and the memory of which was long preserved amongst his posterity, and bent his mind to superstition, man began to multiply; to subdue the earth by culture, to invent the means of extracting fire, to tame and domesticate animals, and to assert dominion over all the works of nature. From his calculations it may be deduced, that man first appeared upon the earth about 6700 years before the present times. He was first produced in the most elevated parts of northern Asia, where the earth

was first cooled to that degree of temperature which suits his nature, that is to say, in about the 60th degree of latitude north. It was neither in Africa, nor in the southern parts of Asia, that the first great societies were formed. The centre of the Asiatic continent, from the 55th to the 40th degree of northern latitude, that is, southern Siberia, was the first seat of civilized man about 6000 years ago. There it was that was first formed that polished and enlightened nation, first deserving of that name, and worthy of our highest respect as the creator of science, arts, and every useful institution. This is demonstrated to us both by the monuments of nature, and the inconceivable progresses made by this people in astronomy. It was this learned nation which first found out the luni-solar period of 600 years; which implies the most perfect knowledge of the motions of the earth and moon, and which was not afterwards discovered or demonstrated till our times by Dominick Cassini. This knowledge supposes a long series of experiments and study, which could not have been brought to perfection under less than 2400 years; and 600 years more are required for man to have formed into society, and to have learned the first rudiments of such profound science. Unfortunately these sublime sciences, cultivated by a happy and wise people, were lost; and nothing remains to us but a few scattered remnants, amongst the nations of the east, which serve to prove their former existence and perfection. From these the Bramins, though totally ignorant both of the nature and motions of the earth and planets, derive those learned astronomical formulæ, and those tables.

from which they are yet enabled to calculate eclipses, without the least knowledge of the principles on which they are grounded. Some relics of this science have been also preserved by the Chinese and the Tartars, who, like the Indians, never invented any thing, but have blindly preserved without ever attempting to perfect what has been handed down to them from the earliest times of their existence. Mr. de Buffon conjectures that, when the earth situated to the north beyond this happy country became too cold, the inhabitants of those parts, as yet ignorant and savage, invaded this region of delights, of arts and cultivation, and annihilated even the memory of science: so that thirty ages of ignorance probably succeeded as many ages of knowledge; nothing but the dregs of these first and noblest fruits of human understanding survived. Religious metaphysics, being above comprehension, required no study, but memory alone always kept alive by the marvellous. Hence, therefore, these metaphysical notions, the adoration of symbolical idols, similar in very distant countries, pilgrimages to the Grand Lama, and the doctrine of the Metempsychosis, were carried to and received by the Indians, the Ethiopians, and the Atlantides; and these same ideas, variously disguised, penetrated amongst the Chinese, Persians, and Greeks. Yet after the loss of science, the useful and necessary arts of life, become more necessary as nature lost her former warmth and vigour, survived, and followed the course of population. The empire of China, and that of the Atlantides in Africa, first arose. Those of the continent of Asia, of Ethiopia, Egypt, and lastly that of Rome succeeded.

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During the existence of these great societies, and downwards to the present times, men have successively learnt to second, to correct, and, in many instances, to ameliorate nature, and gradually, though slowly, to recover those sublime sciences which originally flourished in the once fortunate climate of Siberia. Our author concludes with the benevolent wish that nations, laying aside all the arts of destruction, may at length live in unity and everlasting peace. It is indeed to be hoped, that whilst the people of all countries are deterred by the sad experience of France from ever again pursuing those philosophical theories which must lead to anarchy and the worst of tyrannies, the sovereigns of Europe will at last perceive that wars of ambition, by laying intolerable burdens on their subjects, must shake their thrones, expose their persons to the fury of enraged multitudes, and once more replunge, by succeeding anarchy, all nations into the state of savage barbarism.

Having thus laid before you a faithful abstract of this celebrated system, let us, Sir, impartially examine its several parts.

In this philosophical theory, which is boasted to be so much more satisfactory, so much more consonant to the real testimonies and monuments of nature, and so much more intelligible than the narration of Moses, I apprehend it will appear that many parts are at least as obscure and unintelligible as that author's account of the creation, and that others are in direct contradiction ' —oft

certain and well known laws and facts of nature. Though the essence of the Divine Being is, and ever will be, inexplicable by man, yet the idea of one all powerful and supreme Architect, fashioning at will the materials of the universe, is at least a simple and comprehensible idea. The absolute creation from nothing is indeed beyond our conception; but the eternal existence of senseless matter combining itself in various forms by innate internal activity is no less so. Solid matter is of itself inert, and the solid vitreous basis of the earth, though yet retaining heat, is now totally quiescent. Whence then arose its activity? From heat or fire. Whence that fire? From the pressure of attraction. Whence that attraction? No answer has, or can be given, without recurring to the will of a superior being. In Mr. de Buffon's system, though the Godhead is sometimes mentioned, it is evident that his agency is looked upon as superfluous. All procreative heat and plastic nature are self-sufficient both for the combination of matter, and the production of vegetable and animal life. He seems indeed to except the spiritual intellectual part of man; but this seems rather a concession to prejudice, than a conviction. But to argue with those who think that the most perfect machine, composed of innumerable and complicated wheels, all proportioned and actuated to one great end, without an intelligent maker, architect and director, is more easily conceived than the existence of one Supreme Being, whose omnipotence is sufficient both to form and fashion its materials, would be useless. The subject has already been reiteratedly handled by superior writers, with whom I leave it.

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That the great body of the sun is a mass of glass or pure vitreous matter in fusion, is at least a doubtful and hypothetical idea, and yet on that the whole basis of the system hangs. Mr. de Buffon positively asserts, that the whole matter of the sun, and of the planets, issued from it, is vitreous; and hence it should seem to be implied, that one single primordial substance exists in nature. As this matter was in fusion by heat or fire, one should be led to suppose that he at least admits fire to be a distinct and separate element. But his subsequent reasoning appears to exclude that idea. He assures us that the heat which produced fusion proceeded merely and solely from the pressure of the comets, and from friction. Can any of his disciples explain this doctrine? I apprehend nature will not. We cannot conceive the fusion or liquefaction of any solid without the intervention of some distinct element, whether fire or water, which shall disunite its particles, and keep them floating in its menstruum. Without such intervention, pressure can only condense; and friction could only be momentary till the last period of condensation: there all motion would be at an end. In vain would he suppose fire to be composed of the most subtle and minute particles of the same matter; it would only unite more closely with the grosser particles. To divide and keep these floating, and in motion, it requires that the intervening particles of a distinct matter should have a greater affinity with each other than with those of the substance suspended in it. This part of his system is therefore both inconceivable to common reasoning, and contradictory to the known process of nature.

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The explosion of a neighbouring star or sun, from whence proceed the comets which now press upon our sun, and give it internal heat and motion, is surely a poor expedient, a flight of imagination. If he excludes the will of a Deity, no natural cause can be given for such explosion of a solid body; and if that star was of the same nature as our sun, its explosion, without some exterior cause, is impossible. Gravity and affinity, which he admits, oppose it. What was the sun, and how was it contained in its station before any comets weighed upon it?

The oblique falling of a comet, so as to penetrate and skim the disk of the sun, and carry off with it a portion of its substance, is, I believe, totally contradictory to the known laws of gravity, to those of attraction and repulsion. According to the established doctrine, comets, when in their perihelium, are repelled with a force equal to that which attracted them. If such law, of a mechanism of which we shall be probably for ever ignorant, though the end is visible, existed not, the comet, instead of skimming the surface of the sun, would be infallibly drawn into its vortex, and whirled about with it for ever. The particles, both of its substance, and of that of the sun, which might be expelled by the shock, would be instantly recalled, and reunited by the stronger irresistible force of the attraction of that great body.

Since, without the intervention of any distinct principle or element,

ment, our author thinks it possible to produce heat and fluidity, we are not to wonder that the same single substance is made to produce by sublimation air and that aqueous matter which forms the sun's atmosphere. With a part of the more solid substance of the sun, the victorious comet carried off a share of these to form the atmosphere of all the planets thence composed.

The liquid vitreous matter of which the planets are formed, impelled by the shock to various distances, according to the specific gravities, densities, and diameters of these bodies, cools in various proportionable spaces of time. That a cannon ball, from which the analogy is taken, made red-hot, should, according to its diameter and density, cool in a given time, is according to nature. We know that heat accumulated in any body will evaporate till it is placed in equilibrium with circumambient bodies. If the analogy was followed, the heat of the sun itself would evaporate into space: but the sun, says he, is constantly kept in fusion by the pressure of comets and other planets. In this case, heat would be as constantly diffused. If the sole pressure of the comets and other planets, not only singly but aggregately inferior to the sun, is sufficient to keep that body in fusion, why should not the pressure of that great body, joined to that of the comets, and of so many planets exceeding the earth in magnitude, all weighing upon this small globe, keep it also in the same inalterable degree of heat and fusion?

The whole substance of this earth, and of every other planet, is vitreous, and, like its parent sun, was in a state of fusion when it issued thence. That the whole was once vitrified, and in the state of liquid glass, Mr. de Buffon asserts to be perfectly demonstrated, because all substances, says he, are vitrifiable by heat. But surely to be vitrifiable is no proof of having been really vitrified. But we shall soon see our author making use of a no less absurd syllogism. The shells of all testaceous fish are reducible to lime; therefore all calcareous substances are wholly composed of the exuviae of testaceous fish. Should we not laugh at a disciple of the antient school of Aristotle, who should gravely tell us, all wood is by fire reducible into ashes, therefore all wood was originally ashes: the bodies of all animals may be reduced to ashes, therefore all ashes are the relics of animal bodies?

The assertion that all substances are vitrifiable by heat is not only controvertible, but, according to experience, false. He himself allowed that calcareous substances seemed not fusible by the efforts of chemistry; but he afterwards pretends to have discovered, by more recent experiments, that these bodies may also be vitrified. The whole difference, says he, is, that they must be first calcined before they can be melted (*c*). Taking these dubious experiments as sufficient proof, he proceeds:—The earth, to have assumed its present form, must have been in a state of liquefaction. Fire alone can have that effect on all substances, as many are indissoluble by water; therefore

fore it is demonstrable that the whole earth was originally in fusion by fire, and never could have been dissolved in water. Unfortunately great part of that vitreous matter itself, quartz, which, according to him, constitutes the great basis of the globe, is avowedly refractory to fire : and it is no less evident that granite, which forms the highest primitive mountains, adhering closely to that basis, though now fusible, never could have been perfectly melted. It is not, however, possible to imagine this whole globe inflamed, and in the most violent agitation of boiling liquefaction when first issuing from the sun, without vitrifying every particle of matter capable of vitrification to that ultimate and most perfect degree beyond which our weak operations could not carry it. Its whole composition must have been reduced to the most perfect glass, and like the diamond indissoluble but by evaporation. For this very reason, indeed, because it cannot be melted by our fire, he supposes quartz to be the true primitive glass. He owns, however, that clays and chalks, though formed by water, are equally refractory. Yet this very quartz, this pure glass of the sun, inattackable by fire, is, he allows, reducible into powder, and even into soil, by air and humidity. The same may be said of every other substance, whether refractory or not to fire. Is it from these facts that we are to conclude with him that the earth must have been in fusion by fire, but never could have been dissolved in water? Surely we might more justly infer the direct contrary. Chemistry is his guide ; but from its hitherto known powers we cannot certainly deduce the impossibility of ge-

neral dissolution in water, or of fusion in fire. That same science teaches us, that several substances which by themselves are indissoluble in water, or refractory in fire, yet become easily dissoluble or fusible by the addition of a second body, and sometimes more easily by the addition of a third or more. Consequently, in the great recipient of universal nature, where every force and every kind of menstruum were united, we cannot determine the absolute possibility or impossibility of every substance having been liquidated either by fire or water. This must depend on the inspection of the present state of the various substances of which the earth is now composed; and on the certain effects which we know by experience fire or water must have had on them had they formerly experienced the action of the one or of the other of these elements. I cannot better elucidate this question than by quoting the sagacious reasonings of Mr. de Luc in answer to Dr. Hutton, who has also insisted that all substances have been originally liquefied by fire.

The distinctive characters of solids produced by fusion, says that able naturalist, are, that such solids may be melted again by mere heat; and that after cooling they shall be the same, or nearly so, as before. But of all the solid strata of our continents, lavas only are of this nature: no other solid body can be liquefied by fire, without undergoing great alterations in its constituent parts. If such a solid is composed of heterogeneous particles, they must first be reduced to such a state as to combine with fire in the manner which produces liquidity;

liquidity; and for this they must combine together so as to become nearly homogeneous. It is known by experience, that these combinations are produced by more or less alterations in the very ingredients of the substance; either by the loss of some of these ingredients, or by the addition of new ones, or by both; whence the new solid produced by cooling, bears hardly any resemblance to the solid melted. To prove this, he examines some of the facts alleged by the Doctor in support of his hypothesis, which clearly make against it. On the contrary, for the aggregation of loose and heterogeneous particles by solution in water, it is not necessary that all of them should be dissolved; it is sufficient that that vehicle shall help minute particles to insert themselves between larger ones, so as to multiply the points of contact in the mass, thereby consolidating them as soon as these heavier particles are precipitated, and the superfluous water withdrawn from their interstices is expelled by pressure to their surface, so as to swim above them, or, if the quantity of water be small, is totally evaporated by subsequent heat. This therefore is the only method of accounting for the insertion of woods, shells, and a variety of distinct heterogeneous matters, often in a state of almost perfect preservation, in masses become solid. This alone can account for strata of closely cemented lime-stone found upon loose marl, or of sand-stone and petro-filix upon loose sand or pebbles. If the uppermost strata had been melted, those under them could not have remained unaltered; whereas by solution in water, those particles which had not, either in themselves or
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by adventitious materials, a sufficient number of points of contact, remain in their original loose state after the loss of the liquid in which they floated. Granite, which seems the most general understratum of the globe, is composed of a variety of dissimilar particles, visibly unadulterated and unmixed by fusion, but united by a cement or gluten, the consolidation of which could not have been the effect of fusion, but which may be the effect of precipitation in a solution of water. Water alone would not, perhaps, be a sufficient dissolvent of the cements which unite these particles; but by the mixture of other menstrua ~~of~~ of which we may be ignorant, but which might then operate, they may have been dissolved, and their contents held in a state of fluidity.

Here we have the concise theory of fusion and solution, grounded not on vague opinions, but on experiment and the invariable process of Nature. The undoubted and constant effects of the agency of fire and water prove, on one side, that it is impossible that heterogeneous bodies, composed of perfectly distinct matters, and particularly granites, which Mr. de Buffon contends to have been in primitive fusion, could ever have been melted by fire; and, on the other side, the clear not only possibility, but probability, not to say certainty, that all substances, and granites more especially, may have been held in a state of fluidity by water. I know the instances here mentioned of compact bodies incumbent on loose marble, or on sands, are to be accorded with Mr. Buffon's opinions on a secondary formation

mation by water ; but equal instances may be produced in rocks entirely composed of primitive or vitreous matter, in which strata of loose stone are interposed between others perfectly compact (*f*). Neither could strata of entire different substances, though all equally what is called primitive, lie perfectly distinct one upon another, without even any regard to specific gravity, if all had been melted at one and the same time, which they must have been in the general and perfect fusion of the whole globe. Held in fluidity by water, they may have been deposited one above another, without regard to specific gravity, accordingly as the waters in this or that place, or at one or at another time, may have been saturated by the particles which compose those different strata.

But after having insisted on the necessity of all matter having been in fusion by fire, which, had it even acted upon naturally heterogeneous substances, must have finally reduced them to a state of absolute or nearly absolute homogeneity, Mr. de Buffon is forced himself to have recourse to water to new model the surface of the earth, and produce those varieties of form and apparent natures and qualities discoverable in the now heterogeneous matter of the earth. This he supposes to have been effected in the waters, partly by the attrition and pulverization of primitive matter, and partly by a dissolution which the waters, by their combination with air and fire, and with the assistance of acids, alkalis and salts produced from that combination, were now permitted to exercise on some parts of this same
vitreous

vitreous matter. But if all matter was then equally perfect glass, why not on the whole? In his History of Minerals he allows that even quartz, the most pure of all vitreous substances, may be decomposed by humid vapours, and again reinstated by evaporation; and he admits a secondary quartz and jasper formed in water: rock crystals too, and probably diamonds, the hardest substances and the most resembling perfect glass, he owns, are crystallizations formed by the filtration of waters. Nature and experience therefore shew, that the component parts of the purest vitreous substances may be equally decomposed in water, and again reinstated or crystallized by its evaporation, as by fire and cooling. It will then only remain to know which of the two elements exercised that power in the first instance. If, in the beginning of things, the component particles of vitreous matter might have been disunited by, and consequently floated in, water, that substance had no need of fusion by fire. It is surely quite unnecessary to melt it first by fire, and, after cooling and consolidation during some thousands of years, to reduce it again into minute particles by the medium of water before a second and final consolidation.

Hence we may deduce, that the first of his distinctive qualities which separate vitreous from calcareous matter, the necessity of the former having been formed and melted by fire, is not only imaginary, but evidently false; as the purest of those substances are not only refractory in fire, but are found to be soluble in water, or at least in
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humid air. His second distinction between these two substances will be found, by examination, to be equally controverted by facts. Mr. de Buffon asserts, that vitreous rocks, adherent to the great basis of the earth, are always found in great blocks and masses, undistinguished by beds or strata, and split only by perpendicular cracks and fissures, occasioned by contraction on the cooling of their melted matter ; whereas calcareous rocks are every where deposited in visible beds or strata, horizontal or inclined, according to the primitive basis on which they have been superinduced. No man has surveyed with a more diligent and sagacious eye every part of the Alps, where the nature of every kind of rock is visible, than Mr. de Saussure, in his annual visits for more than twenty years through that vast range of mountains ; and yet he declares that in all their inmost recesses and vallies, as well as on their highest cliffs and mountains, he has constantly observed certain and regular beds, or strata, though frequently of greater thickness, no less in the vitreous than in calcareous rocks. These beds are frequently divided by others of very distinct natures, and sometimes at very great depths under the summits by calcareous strata. Where all the beds are of primitive matter they are distinguished by alternate bands of granite, of schistus, and schorl, and often interspersed with others composed of loose fragments of quartz mixed with other substances. Strata containing no mica are often immediately succeeded by others where that conspicuous substance is thickly strewn in their texture. These strata, in various positions, though generally more or less

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inclined, are, it is true, frequently nearly perpendicular to the horizon, but they sometimes intersect each other, and on the whole face of one mountain in particular appear in this uncommon form ✕. In others, the strata of free or sand-stone are strongly undulated. Many kinds of rocks declared vitreous by Mr. de Buffon, as schisti and slates, are not only in beds, continued in the same inclination throughout whole mountains, but are interiorly composed of an infinity of thin laminæ, and consequently never could have been melted by fire.

Mr. de Buffon laughs at Mr. de Sauffure for having made use of the expression of perpendicular beds, as a contradiction in terms; but waving grammatical criticisms, the expression is intelligible, and the fact true. By whatever name we ought to call distinct bands of matter, in various positions, this is sufficiently understood; and this last author clearly explains, that it is not from the position of the whole mass, but from the interior texture of their substance, that he thus denominates them beds. Great masses of calcareous as well as of vitreous rocks are frequently found in a vertical position. Yet Mr. de Buffon supposes all the former to have been deposited in beds. Both the one and the other have been deranged from their original horizontal position to a more or less inclined and even vertical one by some great convulsion, which has at once subverted whole mountains with all their component strata (*g*). It is not from their actual situation, but from the interior structure and the
veins

veins and grain of rocks, that we are to judge whether they have been formed in beds, and these originally horizontal or nearly so. All schists are, as above observed, whatever their situations, composed of laminæ; and even in the most compact stones the grain and veins are no less visible. In some, as this author observes, mica is strewn in regular lines in one part, whilst none appears in another; and if the mass is placed in an horizontal position, these layers of mica will appear regularly horizontal; which proves them to have been originally formed in that situation, as it is impossible to conceive these particles regularly applied to them in a perpendicular one. Many are the proofs of this which the survey of Alpine mountains afford (*b*).

Neither is the absolute separation of vitreous or primitive from calcareous or secondary substances, established by Mr. de Buffon, better founded in facts: innumerable, on the contrary, are the proofs of their having floated together, before consolidation, in one common liquid. Mr. de Saussure shews, that in many parts of the Alps the transition from vitreous to calcareous rocks is not to be fixed by any line of demarcation. The two substances, towards their junction, whether they lie in strata one upon another, or are joined longitudinally, are frequently so intimately blended and intermixed, as to make it impossible to point out where the one ends or the other begins. In the very inward texture of their substances that intimate mixture frequently appears. Mica and quartz, declared

of the purest primitive nature, are often mixed in considerable quantities in calcareous rocks; and in rocks apparently vitreous Mr. de Saussure has found, by their analysis, calcareous matter, sometimes indeed in small proportions, but also sometimes in quantities equal to a fourth part of the whole. Nature too extracts, at times, the purest matter of both substances from one and the same rock, as is proved by crystals of calcareous spaths being found in the same grottos, called crystal ovens in the country, with crystals of vitreous matter, equally crystallized by the filtration of waters through rocks whose substance seems entirely primitive (*i*). In the space of 3000 toises along the road called Mont-Jovet, in the duchy of Aouft, the rocks through which that road is cut are not only, says Mr. de Saussure, of various natures, and disposed one above another without any discriminating order, but in most of them what are called calcareous or secondary substances are frequently blended with and make a component part with vitreous or what is called primitive matter. This mixture of quartz, of schorl and mica with calcareous substances in every possible form proves, says he, that naturalists have been in too great a hurry to place precise limits between these two species. They are not only blended in the same beds, but those beds are placed above or below each other, without any respect for those laws which they have been pleased to establish. Vide Saussure's Travels in the Alps, vol. ii. 4to. page 398. Hence it appears that both these kinds of matter, before they were consolidated, have floated at one and the same time together, without adulteration, in the same liquid, which

could not be fire. This, indeed, Mr. de Buffon is partly obliged to avow; but he refers it to a second period. Yet if this common solution in water was ever possible, why not in the first origin of things? To this no answer can be given, but that it would render the preceding part of his system useless.

The cracks and fissures of primitive rocks are not, as Mr. de Buffon maintains, perpendicular to the horizon, as they should be in case their masses had been melted in their present situation, but perpendicular to the vein or grain of their interior texture, and horizontal or nearly so, or not forming an angle of more than 35 degrees with the plane of the horizon. This, as Mr. Sauffure observes, is an almost convincing proof that those strata, now in a vertical or greatly inclined position, were formed in an horizontal situation, from which they have been deranged by some subsequent convulsion (*k*). There are other great masses of rock, and particularly the Needles of La Blaitiere, forming pyramids of granite, whose internal divisions are in pyramidal leaves, applied one against the other in an angle of 66 degrees with the horizon, which can be attributed to neither fusion nor deposition, but must to all appearance be the effect of crystallization. Their cracks are irregular, and in all directions.

From all the above observations, grounded not on ideal systems, but on those monuments of Nature which Mr. de Buffon and his disciples are continually invoking, it will appear, that those distinctive

c/ tive characteristics between vitrifiable and calcareous substances, tending to prove the former to have been in fusion by fire, are erroneous, and contradicted by every evidence of Nature. So strong are those evidences, that that author himself has been obliged to allow a subsequent solution in a watery liquid; which consequently makes their prior fusion unnecessary, and a mere gratuitous supposition.

But the power of holding in dissolution the triturated scoria of vitreous matter is not the only one Mr. de Buffon bestows on the waters when once fairly settled on the earth. Between 35,000 and 50,000 years after the formation of this globe, they spontaneously produced aquatic animals, and more particularly testaceous fish. Whether this formation of aquatic animal life was effected by their own prolific powers, or by those singular powers to which he afterwards attributes terrestrial animal life, we are left to divine. However that might be, the multiplication in particular of testaceous fish during 15,000 years was astonishing: it was sufficiently great to produce, from their spoils and relics, the whole quantity of calcareous substances which now cover no inconsiderable portion of the surface of the earth. These substances were, says he, like all others, originally vitreous, but they passed through a filtration which changed their nature; they were formed in water, and are entirely composed of the spoils of madrepores and shell-fish, which have alone the art of converting liquid into solid, and of transforming sea-water into stone. Marbles, and other calcareous stones, are entirely composed either
of

ire shells, or of portions of shells of madrepores, and of all
s fish, often yet easily distinguished in their texture. Cal-
vels are only the broken remnants of these stones detached
s. From all these lime may be made; and lime is also
s: therefore every thing which can be made into
composed of these shells. Such argument surely
on; nor should I think of wasting time on it,
of that authority which Mr. de Buffon, by his
ve tone of assertion, has gained over so many
v adopted his system. I have already
rdity of this syllogism. Whence were
selves, whose exuviae have formed so
rth? Surely his prolific glass, by
unism it was enabled to engender
and infinitely varied forms, endued

much more simple lifeless substance, in many cases scarce discernible
from it; and often not to be discovered but by laborious chemical
decomposition, and the evidence of one single distinct quality. A
longer circuitous process no doubt suited better Mr. de Buffon's
desire of lengthening the ages of formation. Would it not have
been much more logical to have concluded, that these shells are
composed of calcareous particles, because the animals which carry
them feed on that kind of earth, or on plants which spring from it?
Animals draw their sustenance and their growth from the food which
supports

supports them ; each class establishes itself in preference where that nourishment is most abundant, and without that would perish. This nourishment is either directly drawn from the earth itself, or indirectly from those particular plants which that earth produces, or from the flesh of other animals who have been fattened on it, or on its products. Plants themselves draw their nourishment from the earth combined with the other three elements and various salts which they appropriate to themselves by suction and filtration, in a manner which man can neither perfectly understand nor imitate : but the earth is the basis of their nourishment, as well as their support ; and according to its qualities they flourish or perish in different places. Animals in like manner transform into their peculiar substances, by digestion, such earths or plants, or animal flesh, as are proper for their nourishment and growth. The various kinds of fish prosper and multiply only on those coasts, or in those parts of the sea, where the soil and its plants, if such is their food, are congenial to their natures ; and, though accidentally carried to or spawned in other parts, soon perish for want of proper aliments. Animals as well as plants, indeed, by their decomposition, restore to the earth much more than they had drawn from it ; because they have added considerable proportions of salts, of fixed fire, air, and water, which are not immediately volatilized, and which render it perhaps still more proper for the nourishment and growth of future races. I would then allow, with Mr. de Buffon, no inconsiderable increase of calcareous substance, from the decomposition of testaceous animals ;
but

but he must dispense me from believing that the whole fund of calcareous matter is the product of their exuviae. I am persuaded, on the contrary, that the existence of various kinds of earth was necessary, to give nourishment and growth both to plants, and animals which are fed from them; and that if such various beds of earth had not existed before their birth, the seeds of plants could never have germinated, nor those animals, which are nourished directly or indirectly from those soils, have received their proper growth; and that consequently both would have perished almost as soon as produced; and the whole earth would have been, and remained, barren and desert. I will agree with him that most calcareous bodies are apparently sediments deposited by waters; and that the greatest part of the mountains and rocks, composed of that species of matter, bears evident marks of having been formed under the sea; but I believe that calcareous matter is composed of the finest particles of other substances, not excepting vitrifiable ones, deposited by and under the waters, which either originally covered the whole earth, or have covered it at some subsequent period. I am also persuaded that the greatest part of the surface of the present dry land, before a great revolution which entirely altered the exterior form of this globe, was formerly the bottom of the sea. The peculiar salts which impreguate sea-water may have been the means of reducing the decomposition of other substances into those finer particles of which calcareous matter is composed, and of their concretion and more regular deposition in beds. The parts of it so

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formed

formed are consequently somewhat different from those stalactites of the same substance which we see formed under our eyes by crystallization and the filtration of pure waters through the pores of the earth. Without recurring to the slow operations of hundreds of ages, the first total immersion and formation of the earth under the waters, and the subsequent change of sea into land, and of land into sea, by a great revolution on its surface, will sufficiently account for its present appearance and stratification, and for all extraneous shells and bodies, accumulated in former seas during seventeen centuries, now found in sand-rocks and argillaceous earths, as well as in calcareous rocks and bodies.

According to our author, whilst the sea was replenishing, by powers unknown to us, with this multitude of testaceous fish, whose exuviae sufficed to produce all calcareous matter, the highest points of the globe, which the waters had either never surmounted, or which they relinquished as they gradually subsided, spontaneously produced all kinds of vegetables, plants, and trees, without seed or slip, or any of the usual modes of propagation. Heat alone, he maintains, is capable of producing them. To avoid the interference of a Creator, plastic Nature and prolific heat are left to bring forth all the infinite variety of vegetable life, the smallest leaf of which is of a structure never to be sufficiently admired. From the putrefaction of these first plants all vegetable earth is produced. But if Nature alone could give birth to and foster plants of the most luxuriant growth, this vegetable soil
seema

seems rather unnecessary. But in time the powers of prolific heat were to fail ; in those times the powers of Nature in every respect were as much beyond common conception as beyond its present force. This unmodified assertion of Mr. de Buffon, and of several of his disciples (some of whom carry the matter still farther, and assure that argillaceous earths, which according to him are the products of sands rotted in the waters, are composed of the relics of plants mixed with the flesh of animals, and marbles of the bones of these last), is indeed so absurd, that one cannot help wondering how it has been implicitly adopted by so many men of sense and learning. Over and above the particular seed capable of producing and reproducing each particular plant, everything that grows requires a first proper matrix to receive its seeds, and foster its first tender shoots. Without it plants could neither root nor flourish, even for a single hour : neither his hard scoria of melted glass, nor unmixed barren sands or naked rocks, which heat could only render still more barren, could afford such to the first efforts of vegetation ; and the earth, without a variety of soils, must have remained for ever desolate, in spite of all his generating powers. If he had contented himself with assuring that the residuum of plants helps not only to increase the fund, but to extend the sphere of vegetable soil, to places where there was originally none, or very little, we must have agreed with him. Trees, in particular, sending their roots deep into the earth below the vegetable soil, and through the crevices of rocks, most certainly return to the surface, by their decay and by the fall of their leaves, much more

than they had drawn from it. The deep roots of a tree seek, elaborate, and transform into its substance, particles of earth originally barren; and its bark, branches, and leaves, imbibing through all their pores fixed fire, air, water, nitre and salts, and whatever the atmosphere contributes to their composition and growth, add by the fall of the leaves, and finally by the mouldering branches and trunk, much more vegetable substance to the surface than the tree had originally received from thence (*l*).

But vegetable soil is not the only present which these first spontaneous plants have made us: they have prepared for us other treasures in the bowels of the earth. Their decayed substances, during many thousand years floated backwards and forwards and deposited at various depths by the waters, produced coals, bitumens, and sulphurs. Bitumens, says he, are the oils of vegetables decomposed by water, and mixed with acids; sulphurs are a combination of the fixed fire of plants with vitriolic acids: both proceed from vegetables. These impregnated the whole waters of the sea; and these, incorporated with decayed plants and trees, were deposited by the waters in the places where coals are now found, and successively formed at various depths seams of coal in regular strata, interiorly composed of thin laminæ, and yet frequently intermixed with woods and leaves not only foreign to the soil and climate, but of kinds now unknown. These, however, are oftener visible in the strata of argillaceous earths, which are always incumbent on coal, and separate its different

seams. The learned Mr. Whitehurst is of the same opinion as to the origin of coal and of iron, which he thinks are derived from vegetable substances; not that he refers their production to so distant an era as Mr. de Buffon, but to the deluge subsequent to the creation of man, when the surface of the earth to a considerable depth was dislocated and overturned. He also is of opinion, that all coals are inclosed in beds of argillaceous earths, like those of Derbyshire and in the north of Ireland. Such general conclusions are too hasty; as it is no less certain that coals, in some other parts of England, as well as on the continent, are enshased in and adhering to solid rock of various natures, without any appearance of intervening earths (*m*). But even should argillaceous earths be always found incumbent on coal and those earths frequently mixed with relics of plants, it appears not to me any proof that all coal was originally generated from decayed vegetables. I rather take their origin to be the same as that of blue slates from indurated clay, mixed with a bituminous and sulphureous matter, but in greater quantities than necessary to form slates. What seems a strong and I think an almost convincing proof of this general origin is, that the first upper seams of coal are frequently little better than slate; pieces of which are yet half slate, half coal, until the latter gradually becomes more perfect. The best coal is seldom found but in the second and third seams, and there frequently intermixed with smaller seams of half-formed coal. Where argillaceous earths are yet found between the rock and the coal, it is, probably, because those beds are not sufficiently impregnated with
bitumens

bitumens and sulphurs to be transformed into coal; and consequently their appearance rather favours this supposition. As to the forms or relics of plants to be found in the superincumbent clays or rocks, they may be easily accounted for, as conveyed thither by the numerous cracks and fissures opened at the (*n*) great convulsion of the deluge. We shall hereafter also account for these being frequently of kinds not indigenous of the present soil or climate. But should it be granted that all coals originate in vegetables and woods, of which it is probable that cannel coal contains no inconsiderable mixture, yet it is far from necessary to refer their production to a period preceding all terrestrial animals. The convulsion which the earth experienced at the deluge, when great portions of its former horizontal strata sunk deep into the bowels of the present earth, with all their plants and woods, will afford a sufficient explanation. That this has taken place in the neighbourhood of coal mines the same Mr. Whitehurst has fully proved. There, as well as in every other hilly or mountainous part of the earth, vast portions of the originally horizontal strata of the earth, violently rent and fractured, have sunk deep at one end into subterraneous caverns, whilst the other end was raised much above the former level into high mountains, presenting broken precipices on one side, and gentle declivities on the other. That such a convulsion has taken place since the first formation of the earth, his curious investigation of the same regular strata of varied rocks and earths, following in exact similar order, and in the same inclination, uplifted throughout the hills and rocks, where they are
visible

visible in open day, and by mining found to be exactly repeated in the same direction within the earth to the utmost penetrated depths, surely proves to demonstration. He also shews, that where the first or outward strata appear wanting on the surface of the mountains, the ruins or rubbish of these are ever to be found forming to great depths the mixed substance of adjoining vallies, which were in the first moments of dislocation and convulsion immense fissures, till thus filled to their present level (*o*). These evident marks of convulsion, joined to the probable change of former seas into land, and vice versa, which might as well be occasioned by one great revolution as by many, easily account for the mixture of shells and plants found in all parts of the globe, as well on the highest mountains as in the bowels of the present earth, and for the formation of coals from antediluvian forests (if such, which I much doubt, should really be their origin), without recurring to Mr. de Buffon's gradual formation during so many thousand years. If to be accounted for by the effects of one great revolution, the reality of which appears in the general records of mankind, is it reasonable or necessary to resort to an ideal system, unwarranted, and impossible to be warranted, by any tradition, and in its very basis, the spontaneous production of plants, contradictory to the known processes of Nature?

The changes made in several parts of the earth by earthquakes, and the eruptions of volcanos, are attributed by Mr. de Buffon to his succeeding epoch. After such a convulsion as was capable of producing
a general

a general deluge, and such changes as we have already noticed, the war of jumbled elements easily accounts for their frequency and universality, both immediately and for some ages after the deluge. Earthquakes and volcanos, after such a state of confusion, may be easily conceived to have taken place in countries where they are now unknown and unusual; and where, in the uninhabited state of the world, they must have remained unrecorded. They would overturn some mountains, and form new ones wherever they burst forth; or in other places these fires might spend themselves within the bowels of the earth, and greatly alter its interior structure. To this last circumstance Mr. Whitehurst, with some probability, attributes the formation of toad-stone, frequently incumbent on coal mines, and which seems to be composed of melted matter. The effects of these earthquakes and volcanos, and the bursting of the momentary mounds of a multitude of lakes and pools of water, formed in the first disorder of the surface, whose traces are not discernible to common spectators, would undoubtedly produce great subsequent alterations on the yet settling frame of this fractured globe. Of many of these convulsions we can have no record, but it is far from necessary that they should have continued during 10,000 years.

Merely to furnish coals, the use of which was not discovered till many ages after the first existence of man, these plants and trees flourished with luxuriancy for 25,000 years, without affording food or shelter to any terrestrial animal. The time was come when they
were

were to be peopled, and Nature, by a mechanism more wonderful than any yet disclosed, produced the largest and most vigorous of the species. This curious creative mechanism, producing that variety of organised members admirably adapted to the nature of each terrestrial animal, and enduing them with life and motion, through the means of living organical atoms operating by the aid of prolific heat on ductile oily matter, and swallowed up by interior forms and moulds, I shall not pretend to discuss or explain. To me it appears as little philosophical, and as little intelligible, as the entities and quiddities of the Aristotelian school, and an additional proof of those absurdities to which the sublimest human genius is liable. The nature of a self-existent omnipotent Creator is, indeed, and ever must remain, inscrutable to human reasoning; but the idea of such a one is naturally and easily conceived by every understanding; nor can his existence be supplied but by palpable absurdities. To those who, rather than admit an intelligent Architect to the admirable structure of this universe, and of its inhabitants, in which every part is so wisely and so minutely adapted both to general and particular ends, can digest the above-mentioned crude ideas, I leave them to be elucidated.

Following his hypothesis of a yet interiorly burning spheroid, flattened at its poles, gradually cooling on the surface, Mr. de Buffon asserts, that the highest parts of the polar circle were the first susceptible of receiving animal inhabitants. These were such whose natures are congenial to very hot climates. There, by the abundance

of his organical atoms, the elephant, the hippopotamus, the rhinoceros, of a magnitude and vigour superior to their descendants, now confined to equatorial climes, were first produced. Other animals too, of a yet larger size, whose relics are still met with, but are now extinct, existed in those vigorous days of Nature. The proofs are, that the bones of these animals, of a larger size than common, are yet to be found in Siberia and in North America, where they can no longer live. To make this a proof of these countries being their original, and then only habitation, he should shew that the possibility of their exuvia being found there is not to be explained by any other means. Many, however, present themselves. The temperature of the whole earth was probably, as we shall hereafter shew, very different before the deluge to what it has been since; and it was not entirely altered till some ages after it. To this the universal tradition of the vigour and longevity of the first men is at least a collateral testimony. Though elephants, even before the deluge, might not have been habitual inhabitants of Siberia, yet they may have lived in latitudes not very far distant from it; and some of these, flying from the increasing waters of the deluge, may have escaped to find their graves on that high platform; or the waters, prevailing over the whole earth for a twelvemonth, may have transported their carcases far from their native homes. The teeth and bones of the elephant and hippopotamus have, indeed, been accidentally dug up in some parts of that northern region; but if that was their original country, where, as Mr. de Buffon pretends, in those prolific times of Nature,

Nature, they multiplied excessively, it would not be here and there that a few relics of those animals would be discovered, but the whole soil would be thick strewn with the remains of animals who had made it for so many thousand years their abode, undisturbed for many centuries of it by the concurrence of other animals, produced, according to him, long after their first existence, by a much cooler temperature than that which lasted there for many ages. So far from this; the number of these relics, probably greatly exaggerated by travellers, is not so great as to exclude the possibility of their being the remains of elephants brought thither in the train of the armies of ~~Gengis~~-Khan, or Timur-Khan. The existence of the relics of elephants in Canada is, I believe, not quite so clear; but if such are there to be found, they must, and may undoubtedly, be referred to the effects of the deluge. Southern Spanish America is certainly not sufficiently explored to be assured that no such exuviae there exist. If any escaped from Asia after the deluge, they would probably perish in the more northern climates of the new continent. The pretended size of these teeth and bones found in Siberia, much larger than those of similar animals now existing, may probably be ascribed to the more salubrious temperature of the antediluvian world. Hence we cannot admit as proof of his assertion, what may with equal probability be explained by other suppositions full as reasonable. Having ascribed the size of animals to heat, our author is somewhat embarrassed by the whale, the constant inhabitant of northern and even icy seas. For this he finds a subterfuge. These enormous fish were

also the original produce of those vigorous times ; but whilst the two continents were yet united they were shut up in the northern seas, and, contrary to the elephant, grew accustomed to its altering climate ; and, what is still more wonderful in these original creatures of heat, have taken a predilection for cold.

The separation, perhaps at first not so entire, of the new from the old continent, attributed by Mr. de Buffon to this same era, is as easily explained by the operations of a later well-attested deluge as by those of an anterior unknown one. The terrestrial animals now existing in America may have passed over thither since the deluge, by the numberless islands still remaining in the narrow freights between that country and northern Asia, or by more connected lands subsisting some ages after it, though now destroyed by succeeding accidents ; these, as we shall hereafter shew, may have at several periods greatly altered the connections and face of many parts of the earth, by the breaking down of the mounds of many great interior lakes, now thrown into the ocean, of whose former mounds several strings of islands are the only remnants.

To this same period, and prior to the existence of man, our author refers the rupture of the formerly existing mounds through which the freights of the Dardanelles and of Gibraltar have been opened. Though no tradition remains of the more important separation of the two continents, which took place about the same time, or even of the
antiently

aniently hot and delectable climate of Siberia, which continued in full vigour many thousand years after, he yet allows that some memory of the opening of these streights has been handed down to us by history; though, according to his system, man was not yet produced even in the extremest north, and consequently could not have inhabited the more southern regions where they are situated. This, surely, should prove that these accidents were much posterior to his supposed distant epoch.

I will readily agree with him that several records of antiquity give room to think, and that the evident traces of Nature still more strongly shew, that there was a time, and, according to the former, of no very distant date, when the Black sea, still confined by opposing mounds between Europe and Asia, covered a much greater extent of both countries (*p*) northward, and was very probably united in one great lake with the Caspian sea and the lake of Aral; and that, by the bursting of those mounds, either undermined and overthrown by the weight of waters, or rent by earthquakes and volcanos, or by the union of both circumstances, great part of its waters were suddenly poured into the Mediterranean; thereby uncovering great tracts of land behind it, and reducing this great lake, the Caspian, and lake of Aral, to their present dimensions, and inundating the borders of the Mediterranean, till then still separated from the ocean. Both of this event and of the opening of the streights of Gibraltar history has preserved the tradition, though mixed with fable,

fable, and fixes the latter, which would naturally follow the first pretty closely, to the age of the Grecian Hercules, or possibly of a somewhat more antient Egyptian hero, whose name the son of Alcmena had assumed. To some part of his reasoning on the Mediterranean sea I must beg leave to make some objections, as several of his suppositions appear to me neither probable nor founded in Nature.

It is not on the authority of antient traditions, nor even on the aspect of the lands north of the Black sea, or between it and the Caspian, which by innumerable still subsisting traces give room to conclude that they have formerly been covered by its waters, that Mr. de Buffon founds his belief of the much greater antient extent of that sea, or former great lake. The infallibility of his physical knowledge outweighs every other evidence. It is on the unerring calculations of receipt and evaporation of waters that he grounds the assertion; and it is from these calculations alone that he maintains that the Mediterranean sea, before it was laid open to the ocean, must have been nearly as much smaller than at present, as the other was more extensive. The Black sea, says he, must in the time of its full extent have received a much greater number of rivers producing a much greater quantity of water than those that flow into the basin of the Mediterranean; a much greater extent of surface was necessary to the Black sea, when closed, to maintain the necessary balance between its receipts and the evaporation of its waters; whereas the Mediterranean receiving a much smaller supply of waters by rivers, the equi-

Equilibrium maintained between receipt and evaporation necessarily implies a much smaller surface when it was closed than it has at present. The balance of its evaporation in its present extent requires not only the overplus of the Black sea pouring into it through the straits of the Dardanelles, but also a great accession of waters, which he asserts are continually flowing into it from the ocean by the straits of Gibraltar. When unsupplied by these abundant sources, its surface must have been much less, to preserve the necessary equilibrium (*q*).

Here it must be remarked, that the quantity of water supplied by rivers to these former lakes is alone taken into consideration: the quantity of rain falling on their surface is neglected. Rains, however, in the northern climate, to which the Black sea is supposed to have been extended, must have been both frequent and plentiful; and in the Mediterranean, though not so frequent, yet when they do fall in those climates, it is not in what would in the north be called heavy showers, but in torrents. In many parts of these latitudes, notwithstanding many unclouded summer months, it may be doubted whether there does not fall as great a quantity of rain within the year as in the more showery northern climates. The whole quantity of rain falling into water is a real addition to that water. What falls on any given surface of the earth is not only employed to replenish it with moisture when dried up by the sun, but also goes towards the nourishment and increase of the whole vegetable and animal creation thereon existing; whilst the overplus serves to feed perpetual springs and
reservoirs.

reservoirs within the bowels of the earth, the superabundance of which is again carried down to the sea by ever-flowing rivers. On the land, then, rain and dews alone more than suffice for evaporation. We must then consider, that though the power of evaporation is greater from water than from land, yet it is its only drain, and consequently will also leave a surplus from the rain falling upon it, the quantity of which will be increased proportionably with the extent of surface exposed to evaporation. Whatever then might have been the extent of surface of the antient Black sea, it must surely appear, from these circumstances fairly taken into calculation, that the evaporation from it never could have been sufficient entirely to balance its receipts both from rains falling on it and from the tribute of so many large rivers. The surplus thence accruing must have been conveyed into the inferior Mediterranean lake by some great river. Here then is one of the sources of this latter restored to it.

Let us now consider the Mediterranean, closed and shut out, as it was then supposed to be, from the ocean by a barrier between Africa and Spain. We have already seen that it probably, and by a fairer calculation almost certainly, received a very considerable supply by some great river pouring into it the overplus of the great interior Black sea. To this must be added the waters of the Nile and Po, and of all other rivers emptying themselves into its basin, and the quantity of rain falling upon its surface. These ample supplies, if not so superabundant as to have required, like those of the Black sea,
a drain

a drain into the ocean, must yet have been upon a fairer estimation sufficient to compensate evaporation from the whole surface it at present occupies. But all these sources are, says our philosopher, evidently insufficient to maintain its level, since it is certain that a great quantity of water is poured into it by the ocean through the straits of Gibraltar. But this positive assertion is far from certain.

Though the apparently most considerable currents may flow into the Mediterranean, yet there is a current also from it, taking its course along the Spanish shore, which flows the contrary way with such great impetuosity, that ships to enter the straits are forced first to gain Cape Spartel, on the African side, to effect their purpose; especially if they aim to enter the bay of Gibraltar. But even should this superior current flowing outward not be deemed a compensation for those that flow inward, are we sure that inferior currents do not amply make amends for this deficiency? The ingenious experiment of Mr. Deslandes in the gulph of Guinea, recorded by Mr. de Buffon himself, proves beyond a doubt the existence of such inferior currents moving in a contrary direction to superior ones; and this is very justly attributed to the eddies formed by the head-lands of great gulphs and bays (*r*). The same cause may justly be supposed to operate in the straits of Gibraltar as in the gulph of Guinea, and, as this navigator conjectures, in every gulph and bay. Mr. de Buffon allows the general probability; but here he rejects the natural similarity of cause and effect, without alleging any fact to contradict

it, merely because it would militate against his positive assertion. No one doubts but that the Black sea pours a considerable surplus into the Mediterranean, though one might judge otherwise if the apparent superior currents of one part of the streights of Constantinople only were attended to. Over against that city the most rapid of its superior currents drives into the Black sea, along the coast of Asia. In the streights of Gibraltar, though it should be equally certain that the Mediterranean flows into the ocean, I conceive that the superior currents would generally appear to have a contrary direction. In that as well as in all interior seas the tides are very insensible; but its waters meeting at the streights the waves of the ocean agitated by their movements, it is very natural that these should in a manner rise upon their backs, and by that means form superior currents generally flowing inward. This happens in every river when the tide flows; but though it retards, it does not stop the current of the river from continuing to be discharged into the sea. Here not only the flowing tide will have this momentary effect, but the whole body of the ocean coming across the streights must make it permanent; and thus the ocean, though apparently flowing inward, will only retard but not prevent the discharge of that sea by inferior currents. Hence, from the certainty of one great current flowing outward, and the great probability from all these considerations of inferior ones running in that same direction in these streights, it appears at least a matter of doubt whether the Mediterranean receives a supply from the ocean, or discharges a surplus into it.

But

But there is a circumstance which evidently proves the latter to be the case. The undoubted motion and general current of that sea are from east to west. This is ascertained beyond a doubt by the constant, *cæteris paribus*, longer time required to navigate from the streights to the coast of Asia than from that coast to the streights; and hence the nautical term amongst all mariners of sailing up or down the Mediterranean. This circumstance alone, invariable in those parts of that sea where the currents are not diverted into contrary directions by the eddies of a streight, the particular bearings of head lands, or the confluence of other waters, invincibly proves that this sea must discharge into the ocean more than it receives from thence; and therefore that the present and even a higher level of its waters might have been maintained when the ocean was shut out. There is another proof that in its isolated state it must have been, at least originally, as full as the height of its surrounding mounds would allow it. Mr. de Buffon agrees with every other philosopher, that there was a time, the date imports not, when the whole earth was covered with waters. When these subsided into the general bed prepared for them, they ran off from every part which had an outlet into it; but wherever they met with a deep basin, surrounded on every side by banks of a certain height, they must have left it full to the level of its lowest border. If at seasons, in the great and deep basin of the Mediterranean, as happens in little to smaller pieces of water, evaporation exhausted part of its contents, it would at other seasons be replenished from all higher surrounding lands. If this formerly

interior lake was reduced to half its present compass, it would certainly present lands much lower than any known upon the earth, and much below the level of the ocean; consequently, as well the interior reservoirs as the exterior moisture of surrounding higher grounds would hasten even to exhaustion to fill up this deep basin. Notwithstanding all the mounds supposed between them, the waters of the ocean itself would force subterraneous passages to replenish it to its level. In fact, no dry lands now exist so much below its level as these must have been.

From all the foregoing circumstances I conclude, in contradiction to Mr. de Buffon's gratuitous assertion, that natural reasons evince that even when there existed no full communication between the Black and Mediterranean seas, a certain surplus of the former, notwithstanding its extension, was by some river or drain carried into the Mediterranean; and that the latter, though shut out from any direct communication with the Atlantic, must have been originally left full to the height of its lowest banks, and must have been generally replenished with waters to that whatever level; and that therefore, instead of being lower, its waters must have been as much higher than at present as the elevation of its lowest banks towards the ocean permitted. Whatever was the height of its waters, it is evident that this sea or interior lake, overcharged by the sudden irruption of great part of the waters of the Black sea on the rupture of its former intervening mounds, and probably at different periods, prior or posterior, by a like discharge
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of the waters of several other interior lakes in Theffaly, in Asia Minor, and in Egypt, of all which history furnishes us some traditions, must have made, and did make, a great effort against those mounds which till then separated it from the Atlantic, and in its turn broke these down to find a discharge for this vast accession of superabundant waters. All antient traditions confirm these facts by informing us in clear and precise terms, that the sudden discharge of great part of the waters of the Euxine sea, opening themselves a passage through the Bosphorus of Thrace, caused great ravages and deluges on the coasts of the Mediterranean ; and that this accession and new weight of waters caused that sea to overturn part of the rocks which till then separated it from the Atlantic near the columns of Hercules, and, thus opening a discharge into that ocean, again relieved that part of its coasts which had been inundated by the first accident (*s*). Tradition also reported, that the sudden discharge of these waters overwhelmed that Atlantic island of which Plato speaks, situated beyond the present streights. Though the size of that island is probably not only exaggerated, but amplified beyond all credible bounds ; though its very existence may be absolutely fabulous ; yet the tradition itself gives evidence to the frightful idea which mankind had formed of the force of this irruption of waters ; and further indicates that the discharge was not from the ocean breaking into the Mediterranean, but from this last into the Atlantic (*t*). The above observations on this particular subject are in some degree foreign to the consideration of the general system now before us ; but I thought it

it not improper to discuss here this appendix to Mr. de Buffon's history of the Black and Mediterranean seas. It will, I flatter myself, shew the hastiness of his conclusions, every where announced as undoubted axioms. We will now return to the sequel of his plan of original formation, concluding with that of man.

The temperature of the earth and atmosphere was now sufficiently cool for man to live and breathe in, and the abundance of Mr. de Buffon's living organical atoms immediately produced the human species. In what numbers men first started from the earth it is not said; but we may conclude this prolific mechanism could hardly be confined to one single couple on one single spot of the earth fitted to receive this new being. The date of the first existence of man seems to be fixed by our author to between six and seven thousand years ago. He hints the probability of his body having been formed like that of other animals by the sole mechanism of Nature. His intellectual part he indeed vouchsafes to attribute to the intervention of a Divinity, hitherto unacknowledged, and shewn to be inactive and unnecessary: a concession which appears to be rather a sacrifice to what he, no doubt, deemed prejudices, than an attestation of his own fixed belief. Could the powerful Creator of what is most perfect in the world have remained so long a passive spectator? Could he have stood in need of Nature's scarce less admirable previous operations, or have required 67,000 years to form an habitation for man, his only work, alone capable of admiring and comprehending the beauties of
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that universe in which his Maker had so small a share? Mr. de Buffon's doctrine is a repetition of that of the less refined philosophers of antient paganism, who, though they attributed to chance the formation of inanimate and senseless beings, were yet so struck with the *pars divini* of man as to pronounce it an emanation of some superior being. The sublimer genius of a Socrates and of a Plato caught a glimpse of one supreme intelligent author and disposer of all that is. Mr. de Buffon would lead us back into the darkest paths of heathenism. Though the intellectual spark should be a gift of the Divinity; yet if plastic Nature alone supplies the means of its perceptions and enjoyments, it would neither be impiety nor folly to raise once more the altars of gratitude to the sun, to the ocean, to mountains, woods, and rivers. The whole tribe of shell-fish, to whose labours we owe so large a portion of our dwelling and of our comforts, would certainly claim peculiar veneration; and we might justly invoke those living organical atoms parents of life and motion. *Veni, Aura, veni!* might with propriety be repeated by every mouth.

In pursuance of the system, man was first produced on the highest mountains of the polar circle; and it was on the delicious plains of the formerly happy climate of Siberia that was formed, the first great society of virtuous and happy men, the learned institutors of science, from whom are derived the scanty remnants of knowledge of which some traces are discoverable amongst the oriental nations. But
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having already discussed the like assertions of his disciple Mr. Bailly, who has endeavoured to support from history what his master oracularly pronounced as the certain indications of Nature, I shall not again travel over that part of the system. This learned society reigned in peace and happiness about 3000 years, and our present traditions and histories commence only about 4000 years ago. Mr. de Buffon admits that the climate of middle Europe has not lost but rather gained in warmth from the effects of culture in the last 2000 years. If the refrigeration of the globe has been so very slow as to be so easily counteracted, it is evident that the times of the not only warm but hot climate of Siberia must be removed to at least 30,000 instead of 5000 years (*n*).

From the above, I hope it will be allowed, fair examination of this celebrated system of Mr. de Buffon, it will, I think, Sir, appear, that not only its first basis is hypothetical and dubious, but in many points is in direct contradiction with the surest acknowledged laws of motion; that all its component parts are not only controvertible, but very frequently in opposition with facts, and the hitherto ascertained processes of Nature; that the reasonings on which his conclusions are grounded are not only unlogical, but sometimes absurd. His ideal mechanism of Nature, creative both of animal forms and life, is surely as abstracted and as mysterious, and much less conceivable than the intervention of a supreme intelligent architect, which it is calculated to avoid. The Mosaic account of the creation, however
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difficult

difficult to be explained philosophically, certainly presents fewer difficulties to be accorded with Nature, and the present state of things, than this imaginary system so triumphantly substituted to it.

It only remains, Sir, to take a cursory view of some other modern systems, though not equally detailed, and differing in some particulars from that of Mr. de Buffon, yet coinciding with him in affirming the necessity of a long and almost infinite series of ages to produce the actual structure and present appearances of this globe. In contradiction to holy writ, and to the most authentic documents of history, which equally shew us the infancy of population even in countries not very far removed from western Asia, all claim with him the still more authentic monuments of Nature, to prove the much higher antiquity at least of the globe itself, if not of the present race of men. The earth, say some, has undergone not one, but many revolutions, in which the greater part of mankind has often been destroyed and renewed; whilst others assert that the waters in an infinite series of ages are constantly making the round of the globe, successively, and in continual rotation, abandoning on one side former lands, and invading equal portions on the other. As well in support of their common opinion on the great antiquity of the earth, as of the particular parts of their several systems, in which they differ from Mr. de Buffon and from each other, all attest as undeniable proofs the to them certain indications and evidences of Nature, whose book, which all these philosophers read with equal certainty, is so much more authen-

tic than any other. To build such stress upon it, the interpretation of this book should surely be equally authentic, and as such unanimously admitted by all these sages; which we shall see is far from being the case.

Instead of this, some of these authors establish water alone as the *primum mobile* and prolific mother of all substances. Mr. de Buffon had asserted that there existed a general motion or current of the sea from east to west; and Mr. Raynal has adopted this supposed motion as a full and sufficient cause not only of the interior structure of the earth, but of the constant slow progressive revolution which has been from all eternity taking place on its for ever varying surface. According to Mr. de Buffon, this motion immediately succeeded the great current from the poles to the equator, whilst the earth was yet soft and covered by the waters. His opinion is, that when the waters were generally withdrawn from the earth, this same motion, though still continued, has very little effect, and that the land is generally gaining on the sea. But Mr. Raynal contends that this single motion has worked, and is still working, a continual though infinitely slow revolution on the face of the earth, which alone accounts for the present appearances of its structure, and particularly the abruptness of all western coasts and mountains, asserted by both to be one of its most prominent features.

In answer to all these hypotheses I must observe, that the existence
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of this general constant current of the sea from east to west is at least far from certain, if not entirely imaginary. It is attributed to the successive influence of the sun. In calm weather, such a motion preceding its rise is perceptible in the air; but that appears not owing to the direct impulsion of that great body, but to rarefaction by heat. If any thing could create a general motion of the sea, it should be the perpetual motion and rotation of the earth itself, which is from west to east, which would naturally give it in that direction. The great attraction felt by the sea is that of the moon, which is equal on all parts of the great body of the ocean as it successively passes over it. The general current of the Atlantic seems to be from north to south (\propto); though that is infinitely varied from the different bearings of the lands, and probably from the direction of the valleys in the bed of the sea, or from other causes as yet hidden to us.

The abruptness of all western coasts is far from general. The coasts of middle western Africa are not usually abrupt, but gentle; though those of its northern and southern parts on the same side are steep. Nor is it more true that all western sides of mountains are abrupt. In mountainous countries precipices often front each other; and, when distant, as often look to several quarters indifferently, to north or south, to east or west. All that can be said is, that in some great chains the more general aspect of its precipices may be to one particular quarter, though various in different ranges; and this we shall hereafter endeavour to explain. Mr. de Buffon's idea of the

supposed western precipices being formed, whilst the earth was yet soft, by the precipitate fall of waters from accumulated heights, is at least plausible; but it is utterly impossible that Mr. Raynal's flow motion should ever form such. As Mr. de Luc observes, this pretended flow progressive motion of the sea from east to west, as for example, from the coasts of Chili and Peru, which seem to have given rise to this generalised idea, could never leave precipices behind it, but uniformly and gently sloping declivities, diversified at most by sand-banks thrown up by accidental storms and winds, whilst it would, on the contrary, undermine and break into abrupts the shores it invaded. The real fact is, that the abruptness or gentle declivity of all shores, whether eastern or western, depends solely on the situation of mountains. Wherever these are near the sea, with their precipices turned towards it, its coasts are steep, and its waters proportionably deep: wherever they are far removed within land, or turn their backs to the sea, a gentle slope conducts to its shallower waters. This is I believe almost invariable; and I flatter myself to be able to account for it also from a cause at least as probable as any these authors have offered us. The example which Mr. Raynal adduces of the invasion of the sea upon the land from this general current is rather unlucky. Chinese industry, says he, has been for ever struggling against this general motion of Nature from east to west constantly menacing them with submersion. The fact is, that the eastern coast of China has been invariably gaining upon the sea instead of losing from its invasion. Chinese activity has only done what the Egyptians
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and Dutch have done on northern or western coasts, and what is daily executing on many others. They raised dykes in order to gain somewhat sooner to cultivation those shallows which the sea was ready to relinquish, and which the successive deposits of great rivers were beginning to raise above the ordinary level of its waters, and by advanced mounds, for some time exposed to the fury of the waves, defended these new acquisitions from the effects of extraordinary tides and tempests. The Chinese history uniformly acquaints us, that its eastern provinces on the mouth of the Yellow River were formerly covered with water, and were by industry successively drained and extended. The yet nature of this flat and marshy country sufficiently corroborates this account. The sea coasts where there are neither bays nor rivers change not perceptibly, unless by sudden and uncommon accidents of storms, tempests, or earthquakes. Instead of the pretended rotation by which the sea gradually gains on one side what it loses on the other, by a general motion, which is at least doubtful, it is evident that whatever flow changes, unless by partial accidents, do take place, are universally in favour of the land. Whenever the coast presents steep rocky cliffs, either the constant dashing of the waves undermines their foundations, or the wind and weather wear away their mouldering summits and faces, and detached fragments are constantly falling at their feet. However slowly, these at last, by their decomposition, present a more indestructible fence against the fury of the ocean, a sloping beach on which its waves have no hold. Wherever, on the contrary, almost level plains or sloping
shores

shores conduct to the limits of the ocean, it is evident that every part of the higher lands, from the most elevated mountain to the smallest mount, washed down by rains and torrents, slowly contribute to raise these shores. The hardest rocks on the mountain's summit decay, and their fragments are carried down by torrents, and by these conveyed to rivers, where pulverized at length, they both raise the beds of the rivers themselves, and by their inundations add something to the adjacent plains (*y*). Large and strong rivers throw up and extend sand-beds wherever they discharge their waters into the sea, and by more abundant deposits at length raised above the reach of its waves, often accelerated by human industry, prolong the continent, and incroach upon the ocean. The slow operations of Nature thus evidently tend to level its heights; and the more rugged these are, the faster they are worn down. Slopes alone, close covered with grasses and plants, oppose this general degradation of every higher ground; but these are often attacked by hasty rains and torrents, and contribute their share to the general elevation and extension of the land. The common receptacle of all deposits which are hurried beyond the land, the bottom of the sea must be raised from their accumulation, and must in consequence raise the level of its waters; but as by much the greatest share of these deposits are stopped before they reach it, and as the surface of the ocean is much greater than that of the land, this must be proportionably in a still slower progression. It is universally acknowledged that the cold of every climate depends greatly on the elevation of the land above the level of the sea. As by this two-fold operation,

operation, however imperceptible, the height of every eminence above this level decreases, our most distant posterity has not to fear that increasing cold with which Mr. de Buffon menaces it, and which will freeze all Nature in 90,000 years. On the contrary, we may with confidence predict to it a much softer temperature. The mountains gradually lowered, the plains and general surface of the earth levelled and extended by their spoils, the bottom of the sea and the level of its waters raised, must be continually, however slowly, producing that effect; though I shall not presume to calculate in what number of years it will become perceptible. A general milder temperature will be much more rapidly accelerated by the increasing cultivation and population of the north. Less than two centuries will probably see a hundred millions of inhabitants in the present territories of Russia vigorously contributing to this change.

Mr. Pallas, intent on volcanic fires, whose traces appear to him in every corner of the earth, asserts that the positions of seas and lands have been perpetually changing from the effects of their explosions. He places their great focus amidst the Molucco islands. He maintains that the eastern ocean, heaved up by dreadful volcanos and earthquakes, invaded the immense tracts of land which he supposes to have existed formerly between the present Indian and Chinese coasts, and the Philippine, Mariane, and Caroline islands, New Guinea, New Holland, the Molucco and Maldiva isles, whose outward coasts describe the limits of a former continent united to, and part of that
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which exists at present. From these imaginary premises he contends, that the whole earth has been successively invaded on one hand, and heaved up on the other, by the effects of similar volcanos taking place all round its surface. When such unsupported systems are gravely palmed upon us, shall we think it necessary to refute them? And shall we on such grounds reject the scripture account corroborated by the general traditions and history of mankind, although some points may not yet be clearly explained to philosophers? I shall perhaps agree with him that these islands may have been once connected with the continent, though not by solid land, but by an interior sea, whose mounds these islands may have formed. However terrible and great the effect of earthquakes and volcanos, the shock which could have destroyed and sunk such immense tracts of solid land as he supposes, must have dislocated the whole frame and basis of the earth, and even altered its position. Such destruction, and even greater, from whatever cause, may have happened at that deluge which covered the whole earth with water, when, as I apprehend, and shall hereafter explain, the very centre of gravity of the globe was displaced; but such vast alterations could not have been effected before or since by any force of explosion without a revolution similar to it. To have swallowed up such great tracts of land the most important changes must have taken place in the interior of the globe. But one or more mediterranean seas, left by the waters which had covered the whole earth, wherever they found a closed basin to receive them, are easily conceived, and are very natural circumstances consequent to the

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STRUCTURE OF THIS GLOBE.

the idea of a general deluge. It is not more difficult to imagine that the weight of waters accumulating from surrounding lands, aided very probably in that climate by earthquakes and volcanos, may have in process of time broken down their mounds in the weakest parts, and thus have greatly altered the face of a considerable surface of the earth without endangering its frame. In the Black and Mediterranean seas, surrounded as they are on every side, one single point excepted, by vast continents, one part only of their barriers was liable to such an accident. In the Baltic two passages have been forced. In the interior sea or seas of which we are speaking, many parts of their mounds may have been equally weak, and thrown down either by the waters or by earthquakes. The majority of the islands indicated may be conjectured to have been the strongest parts of a narrow chain which formerly connected them with the continent, whilst others may have perhaps been formed by the ruins of that land carried to a distance by the irruption of such an immense body of waters, till then suspended much above the common level of the ocean. Thus we may here, as well as in the gulph of Mexico, allow the probability of that former connection with the continent which seems to be indicated by a nearly regular continued chain of islands, without endangering a dislocation of the whole frame of the earth, which certainly must have been the case if such vast tracts of land had been destroyed by the sudden explosions of volcanos kindled in its bosom. It is perhaps necessary to admit such alterations in that part of the world since the deluge, in order to explain the finding of elephants in the Mo-

THOUGHTS ON THE

lutes long before the construction of ships sufficiently capacious to convey them thither.

Sir William Hamilton, Mr. Ferber, and Mr. Brydone, the two former of whom have particularly applied themselves to the study of volcanos, without giving general systems, have affirmed that the certain indications furnished by these phenomena announce beyond all possibility of doubt, not one but many revolutions in this globe during an infinity of ages; and according to the last of these gentlemen, the poor abbé Recupero trembles in secret for the credit of the Old Testament.

Seams of vegetable earth repeated at several depths, frequently found under and over distinct and successive beds of hard lava, and the whole exteriorly covered with vegetable earth composed of the mouldered scoria of lava, whilst in other places lavas are found as intact as when first issuing from the mountain, appear to these gentlemen certain and undeniable proofs of the incalculable antiquity of volcanos, and consequently of the earth itself. They do not advert that all lavas are not composed of the same substances; all have not undergone the same degree of vitrification, and of course are more or less susceptible of decomposition. When their composition is the same, much depends on the state in which they are emitted. When poured from the crater in the ferment of boiling liquefaction, a dross or scoria rises like broken waves upon the surface, and is easily pulverized

verized by the air and weather. When the heat is less violent, or the torrent is cooled in its course, an even impenetrable surface defies the influence of the atmosphere. These philosophers do not recollect that Herculaneum, the date of whose destruction is well known, is covered by nearly 70 feet of lava, interspersed with seven distinct seams of friable earth, the whole covered with good soil. Yet all this has been the undoubted produce of less than 1800 years. Other lavas, probably issued at the same epoch, remain on the contrary hard, impenetrable, and bare of soil. Volcanos, especially on their first eruptions, or when these have been preceded by a long calm, throw out materials of very different natures. At their first opening they must disgorge all superior incumbent matters, all that variety of strata of different rocks, of earths and sands, of which the mountain was composed; many of these pure and unmixed, or mixed with water only; others more or less calcined, reduced to ashes, or melted by a mixture of metals. Sometimes they vomit huge unaltered masses of solid rock: and this seems to have been alone the case of a volcano in the isle of Ischia, in an eruption about 600 years ago; after which its fires immediately subsided, and yet remain extinct. There a valley of above a mile in breadth and two miles in length is yet to be seen covered with vast fragments of granite, many containing 20 or 30 cubic feet, in the very self same state in which they are found in the mountain from whence they issued, whilst no traces of melted lava are to be perceived. Something like this must not only have happened at the first breaking out of Vesu-

vious, but does happen whenever by taking a different direction its mouth is changed. At other times, volcanos vomit deluges of sand and water ; and again at others, clouds of ashes and pumice-stones ; and finally, torrents of liquid fiery matter, in which all these have been completely melted to form that heterogeneous substance called lava. All these irregularly successive eruptions of various matter must form beds more or less solid, or more or less destructible by air or weather ; and these different strata require not ages to accumulate without order one upon another : a few months, nay, a few days, are sufficient to produce a repetition of all these different layers in one place, whilst in another the original soil is thinly covered by a single bed. Lavas apparently the same are in one place hardened and in another softened by their exposition. The rivers of lava are generally hardest, and remain most intact, near the sea. Cooled in their passage, they had subsided into a calmer state of liquefaction, and perhaps the salt air and water may have the effect of indurating. After the first recorded eruption of Mount Vesuvius, of which the younger Pliny was a witness, and has left us an accurate description, its fires totally ceased in the sixth century, and remained extinguished till the fifteenth, when the mountain was entirely fertilized not only to its summit, but even within its crater, then covered with vineyards. The witnesses of this renewal of eruptions deplore the ravages occasioned on so rich a spot. This is a proof that the scoria of its former lavas had in some hundreds of years generally formed a rich vegetable soil. It shews also, how little time is to be measured by the repetition

repetition of eruptions. The fires of Vesuvius have been kindled ever since, but important eruptions have taken place at very unequal distances. The great eruption of 1736 was succeeded by a calm to 1752, since which eruptions have been frequent for the last 40 years, and have greatly altered the state of the crater and of the whole mountain (z). Since such important changes have been effected by a few eruptions within that time, will these gentlemen pretend that thousands of years are necessary for those uncertain ones of which they think they have observed the traces?

These systematic authors often fall into evident inconsequences. Mr. Ferber asserts, that many hundreds of ages are required to have raised Vesuvius to its present height, which he thinks, and possibly with reason, is the mere ruin of a formerly much more elevated volcano; and yet in the same breath he relates the formation of Monte Nuovo, which is 1000 feet high, and three miles in circumference, thrown up in 48 hours by the efforts of one single explosion, unsucceeded since by any other. Between the islands of Tercera and St. Michael, the sea vomited amidst fire and flames in 1628 a new island, on a spot where before its waters were 160 fathoms deep. This island contained at first only five or six acres, but in fourteen days became three leagues in length, and a league and a half in breadth, and rose 360 feet above the water. In 1669 the quantity of matter emitted by Mount Etna was more than equal to the whole volume of Vesuvius. An eruption at Arequipa in Peru threw up in twenty days a quantity of sand and ashes which,

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if spread out to the depth of three feet, Mr. Whitehurst computes would occupy a space of 34,636 square miles. Many more instances might be given, in almost every age and region, of mountains and islands thrown up in very short spaces of time: and not fewer of mountains sunk; amongst which I shall only mention the Pico in the Moluccos, accounted of equal height with that of Teneriffe, entirely swallowed up into the earth, and leaving a lake behind it. When philosophers are well acquainted with such vast changes effected in a few hours or days, with what face can they assert that hundreds of ages are necessary to produce others of much less magnitude? Mr. Ferber has moreover here taken for granted what is by no means certain, viz. that the whole of Vesuvius is a volcanic production. Though we have seen, from the above-cited instances, that this is possible without the continued operation of an infinity of ages, yet from all appearances it is by no means probable. Vesuvius is connected with, and forms one, though an exterior one, of a very extensive chain of mountains to which it naturally belongs; and therefore its entire formation is not rashly and without proof to be attributed to extraordinary accidents.

Mr. de Buffon gives it as his positive opinion, that the focus of volcanos is not deep within the bowels of mountains, but very little below their apparent fires. Others, and I think with much more probability, assert, that in some mountains at least the focus is not only below, but much below their roots. The cause of earthquakes
certainly

certainly lies very deep in the earth, and frequently below the bottom of the deepest seas: sufficiently proved by their extension through vast tracts of countries separated by intervening seas. Volcanos are no other than the funnels through which these commotions find a vent. A sensible connection has been long observed between Vesuvius and Mount Etna, which must be by communications under the sea which separates them. Both in the convulsions of earthquakes and volcanos the neighbouring seas are violently agitated, and the first effects of explosions in Vesuvius as well as Etna have generally been the vomiting vast quantities of water, sucked up into their vortex by constant or temporary channels; and this in the latter mountain was accompanied in 1631 and 1698 by great quantities of calcined sea shells; which leaves no doubt whence these waters were derived. We may here observe, that sea-water, as long as it is thus sucked in and mixed in the cauldron of melted matter, may greatly alter the nature of the lava immediately following, and may be no small cause of its being more or less susceptible of decomposition. Thus do we find on every point the frequent disagreement between these infallible interpreters of nature, whose decisions are so often founded on doubtful, partial, or erroneous premises. Whatever difficulties may occur in the narration of Moses, it is not surely such authorities which can yet shake its credit.

Mr. de la Condamine, Sir William Hamilton, Mr. Ferber, and Mr. Faujas, having discovered evident traces of volcanos in Italy, Germany,

Germany, and in the Vivarais, in parts where no records of history inform us of such events, from thence confidently conclude that the world is much older than either scripture or history can warrant, and that it must have gone through unknown revolutions in an infinite succession of ages. In the sinking of a well at the foot of Vesuvius about a mile from the sea, on the spot where the city of Pompeia stood, says Sir William Hamilton, ten alternate strata of soil and vitrified stone were found before a stratum of soft stone appeared, when the quantity of water prevented further researches at the depth of about 67 feet. At the depth of 21 feet, coals, tools, and an inscription relative to Pompeia, were found under the fourth stratum; therefore the fix under strata proceeded from eruptions prior to the building of that town, said to be founded by Hercules, who is here intimated to have lived in the days of Abraham, more than 1900 years before Christ; and hence is insinuated the length of time required for the date of the lowest stratum of lava. Herculaneum may indeed have been founded by Hercules, or it may have been built by the Heraclidæ during their expulsion from Greece, or perhaps some ages after, in honour of that hero. Pompeia may or may not be of equal date, equally unknown and unfixed even by fable. But we must here observe, that the Grecian chronology carries not the age of Hercules to 1300 years before Christ; and that we have already shewn it not to have really exceeded 1000 years before that era. Hence much is to be defalcated from this premised high antiquity. Mr. de la Condamine says, and probably with reason, that the lake of Albano, the

the existence of which dates before the building of Rome or Alba, is no other than the tunnel of a former sunken volcano. Both he and Sir William Hamilton, from the inspection of the soil and rocks adjoining both to Rome and Naples, and almost throughout all Italy, announce the evident traces of volcanic productions, and of volcanos unrecorded in history. The latter thinks the sea formerly washed the foot of Vefuvius; and this might probably be the case when the waters of the Mediterranean were much higher before the opening of the streights of Gibraltar; and that the mountain itself is an entire volcanic production, thrown up from the bottom of the sea. This too may be possible, though not probable. We will also agree with Messrs. Ferber and Faujas, that undoubted traces of former volcanos, of which not the smallest traditions remain, are equally to be discovered in many parts of France and Germany. The Giant's Causeway in Ireland seems also an indisputable volcanic production; and many other evident signs of volcanos having existed beyond all historical records, are probably discoverable on every quarter of the globe. But on the evidence of these generally just observations the antiquity of the earth, either before or since the deluge, is no wise dependent. It is not at all necessary that a single age should be added to the usually supposed date of the deluge, to comprehend all these ancient events of nature, though now, in many of these countries, and unrecorded in any. In the first place, from the experience of what we do know of volcanos, it appears that time can neither be estimated by the number of eruptions, nor

unusual

by the accumulation of different strata vomited by them. As we have already seen, Vesuvius, after a succession of eruptions from the days of Pliny to the sixth century, ceased entirely until the fifteenth, since which it has more or less raged at very unequal distances to our times. A few years, months, and even days throw out varieties of matter to form very different strata; and in one place these have been accumulated one above another in a few days, whilst in others their succession has been the work of ages. One day the eruption is entirely composed of water, mud, sand, or ashes, capable of becoming immediately good soil; and the next day nothing proceeds from the mountain but torrents of melted matter of various degrees of heat, spreading over these strata of vitrified lava, more or less susceptible of decomposition. From the repetition of varied strata in any place, no proof of the time employed in forming them can therefore be drawn. In the second place, though evident volcanic matter may appear in parts or countries where history and tradition are entirely silent as to the existence of volcanos, it is not necessary that these should date from an infinite series of ages. If these volcanos existed only in the first five or six hundred years after the deluge, should we have any account of them in countries which either were not then inhabited, or were inhabited by dispersed barbarians, who have left neither traditions nor histories after them? It was very vaguely known to us, through the first conquerors of Peru, that there were volcanos in that country; but it required that Mr. de la Condamine should visit it, to inform the learned how frequent and multi-

plied they are in the vast range of the Andes. From the time of that country being seized by the Spaniards near 300 years ago, how many volcanos have broken out and how many have been extinguished in those extensive mountains, which that mysterious people have kept a secret from these enquiring philosophic ages! Our posterity, observing no records of these any more than of others which have preceded them, may with equal authority take a fancy to date them from 3000 or from 30,000 years. After a convulsion whose effects had sunk the former lands into sea, and elevated the bottoms of antient seas into mountainous continents, it is not only natural but probable, that, from the war of contending elements, great commotions, earthquakes and volcanos should take place on every part of the yet trembling surface of the globe, not only immediately after, but during several ages, whilst the new earth was yet gradually subsiding to its present state of quiet. Air and water pent up in the first confusion within its bowels, at length heated and rarefied by kindling fires, would at various periods burst their prisons again to inundate small portions of the earth. The proximity of sea and waters is thought greatly to contribute to the kindling of subterraneous fires. For many ages after the deluge, it appears that several seas, as we have already observed of the Black and Baltic seas, were much more extensive than at present; and from the aspect of several countries it is nearly demonstrable, that the waters of lakes which still exist were at some period much higher than at present, and consequently covered much more extensive tracts (*aa*), whilst the yet visible basins

of other lakes, where no waters now remain shew that they have once been much more multiplied (*bb*). There was a time when Europe appeared to the Asiatics an assemblage of islands, and from thence was antiently called by them the Isles of the Nations. If we figure to ourselves the extension of these seas and the existence of lakes, of which some traditions remain, on the parts adjoining to Asia, we shall not be surpris'd at the appellation. As well the traces of these waters, as of volcanic matter, found in countries where no waters or fires now exist, equally shew us that both have disappeared for many ages, but by no means demonstrate that they are to be dated from an incalculable number of years. For many ages after the deluge, no part of Europe, not even Greece, was fully inhabited. We have already shewn that, even according to the erroneous chronology of Greece, the first civilized colonies who fixed in that delightful climate arrived not there sooner than three centuries after the Hebrew date of the deluge, which is itself probably erroneous by at least three centuries; but that, according to the most probable corrected chronology, these first colonies settled not there until four centuries later, and not before 1500 or 1400 years before Christ. Whenever they are to be dated, they found no other inhabitants but roving savages, who left neither traditions nor histories behind them. These colonies required several ages to become numerous societies, and histories were not written till many ages after: what wonder then that we are not informed of the events of nature during such periods? Of some very important changes in the aspect
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of the neighbouring countries; the opening of the streights of the Bosphorus and of Gibraltar, history from imperfect traditions does inform us; but of how many events preceding these must it be silent! If in the more scientific times of Greece and Rome such are sometimes recorded, in their more antient story those only which happened to produce impediments in their warlike expeditions, and had whole armies for spectators, are casually mentioned.

Shells, and sometimes the impressions of fish inclosed in argillaceous, sandy or calcareous rocks, and often at very great depths under the surface, are, according to many of these philosophers, irrefragable proofs of the great antiquity of the earth. The date usually allowed to it certainly gives ample time for the induration of these rocks; and natural accidents, both at the deluge and previous to it, will easily explain the mixture of shells in their primitive state of soft mud. No person doubts but that there exists in nature a well averred petrifying quality which hardens into rock, and that from many well-known instances (*cc*) in a very short time, such substances as are capable of petrification; and therefore, that it is impossible to fix any number of years which would be required for their complete induration. Many of the present rocks were possibly hardened under the waters, whilst other beds of formerly liquid mud or sand have taken the consistency of stone within the bowels of the earth. On these beds, previous to induration, extraneous bodies may have often been deposited, and again covered by new sediments whilst they yet remained

remained under the waters. Accordingly as the substances which compose these rocks have been deposited slowly by the tides or suddenly accumulated by violent tempests and currents, either before the deluge, when most of the present lands were seas, or during the deluge itself, or after it during the existence of many waters long since disappeared, these rocks are formed of homogeneous or heterogeneous, of calcareous or vitrifiable matter, mixed or unmixed with pebbles rounded by the waters, enclosing or not enclosing various shells of one or of different species, as these happened to have been generated in the former seas now become parts of our continent. Larger and more active fish have also been accidentally buried in these former muds, which yet retain their impressions. Most of these were buried or intimately mixed with the deposits accumulated by the agitations of antediluvian seas, which covered them for ages. If they are now found on the tops of our mountains, or deep buried in our plains, it is owing to, and a proof of, the great changes operated by that great convulsion which dislocated the whole exterior coat of the earth. If fluviatile as well as marine shells and fish are sometimes found enclosed in stone, it is because the rocks in which they are contained lay under interior seas or lakes, many of which, though now reduced or perfectly drained, covered great tracts of land for many ages after the deluge. Neither is the frequent appearance in our cold or temperate climates of shells belonging to fish either now unknown, or inhabiting the depth of the sea, or living only in hot climates, any proof of multiplied revolutions on this earth in an infinite

finite succession of ages. In the great changes operated at the same time and by the same cause which was capable of inundating the whole earth at the deluge, the outlines of which, authorised both by the natural consequences of a convulsion adequate to that effect, and by the actual broken and visibly dislocated structure of the earth, I shall hereafter attempt to draw, the waters must in their agitations and retreat have hurried with them the spoils of former seas now elevated into the midst of our continents. Hence the transposition of the exuviae of shell-fish to places far distant from their native beds is easily conceivable. This alone will account for origins of very different climates from those in which their exuviae are now found. But I shall also hereafter shew, that both the general temperature of the antediluvian world, and the particular climates of many parts of it, were very different then from what they are at present; and that, by the very probable change in the position of the globe itself at that epoch, countries now far removed into the temperate zone then lay under or not far distant from the tropics. From all these different observations it will appear, that all these phenomena may be easily accounted for by the immediate or consequent effects of one single well attested revolution, without adding one single year to the age of the world. The effects, however great, which I have hinted at, can scarcely be exaggerated, as a convulsion which could have laid the whole earth under water even for a moment, must be conceived both violent and universal. From it alone, when duly considered, the appearance of the shells of former seas deep buried

on the summits of our mountains and in our plains may be explained without the aid of frequently repeated revolutions. If the various phenomena which strike us are the effects of convulsion, why not of one alone sufficient for the purpose?

I must not pass unnoticed the opinions of many less bold and less systematic philosophers, who are convinced with me that the date of the last great revolution which the earth has undergone cannot be very remote, but yet think themselves obliged, by the various phenomena of geology, by the formation, the crystallization, the deposition and arrangement of stony matters, to admit, if not the eternity at least the infinitely far removed origin of what they call the carcass of this globe (*dd*). Such seems to be the idea of Mr. de Saussure; and others, such as Mr. Bourit, flatter themselves that this far removed antiquity is reconcileable to the Mosaic narrative. This however appears to me impossible, as according to Genesis the whole work of the creation, including that of the abyss, of the earth, of the sun, moon and stars, is there represented, not as an interrupted, but as a continued operation completed by the formation of man, whose existence is limited to 17 or at most 22 ages before the deluge. But I must own, that it appears to me surprising, that persons so familiarized with the phenomena of chemistry; who are daily witnesses, in our little chemical experiments, of the promptitude with which the intimate mixture of the most dissimilar matters is effected; who as quickly see them again separated and deposited according to their affinities; who
view

view without astonishment the crystallization of different salts in regular though various forms, the arborisation of metals, and the decomposition or the sublimation of the hardest substances within the short interval of a few hours;—it seems, I say, surprising, that such persons should think it necessary to recur to the operation of infinite ages to conceive the concretion or crystallization of stony substances in the great laboratory of nature, where every kind of menstruum was abundant and every kind of agency at hand, and surely many as yet unknown to chemists. (cc) The simple and familiar operation of the churn may give an easily conceivable and perhaps no inapt idea of the formation of the different grosser substances of the globe. The rotation of the earth, the forces of affinity or repulsion, will surely supply abundant motion to excite the necessary fermentation. Could then the great Creator, who had all the materials and all the forces of universal nature at his command, require innumerable ages to accomplish operations which are not in fact more difficult to be conceived, and differ only in magnitude and variety? Would the seemingly gradual deposition of calcareous particles, or the concretion or crystallization of vitreous ones, require thousands of years from the hands of the Omnipotent, whilst the milkmaid sees similar effects proceed from her feeble operations in a few hours? But if, after all, six days of twenty-four hours should yet appear to these gentlemen too short a time for the pretended very slow deposition in beds of many substances, I will observe, that the duration of that night which preceded the creation of light is by no means limited by

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Moses ; and that, as I shall hereafter shew, the days of the creation, and particularly the first, are probably not to be measured by ours. From these they may take the time which they may still think necessary for the completion of operations, which, they will however own, are not to be calculated by the powers of feeble man.

From this impartial review of the several systems of modern systematic philosophy, and the cursory observations I have made on them, you will, I think, Sir, find that their very basis is either founded on dubious, mistaken or perverted facts, or in many points directly contradictory to the only well-known fundamental laws of nature ; that the conclusions drawn from partial, controvertible, or real facts are generally hasty, and by no means convincing. Hence, whatever may be thought of the Mosaical narration, and of the most antient traditions of mankind, according with it in every main point, they are not yet overturned by any system hitherto broached, claiming superior and much less unrestricted confidence. If the brief account of the creation and deluge given us in Genesis is yet insufficiently explained to these sublime philosophers, should it even still remain inexplicable in all its parts, and should we yet find it difficult to adapt to it the actual phenomena of this earth, the question still will be, whether its veracity or our insufficient knowledge of nature is to be controverted ?

NOTES AND ILLUSTRATIONS

TO

LETTER IV.

(a) Page 283.

HOW is it possible, say many of these philosophers, to give the smallest credit to an author who tells us of so many miraculous facts, which we declare to be impossible, because they are contrary to nature? If the laws of nature are the will of God, they must be, like him, immutable. Such are the sophisms of these sublime reasoners: but plain common sense, at least as valuable as their logic, can easily conceive that the free author of a work disposed to answer one general end, may, yet without absurdity, momentarily alter the direction of some part of it to serve a particular purpose, without breaking into his first design. But in whose favour, continue they, could these infringements on the general laws of nature be permitted? Is it credible that it should be for the most insignificant, the most unworthy, and the vilest race that ever crawled upon the earth? The national vanity of this Jewish writer is still more absurd, and more impertinent, than that of the Egyptians. But does that vanity appear like theirs in perpetually exalting his nation above all others? Whilst he tells them that they are the predestined instruments in the hands of God, to preserve his name to future nations, does he aim to exalt their origin above that of other men? On the contrary, he for ever lays before them their forlorn

and defenceless state, from which they were raised, not by their own powers, but by the hand of God. He shews them to be one of the last and smallest branches of then existing nations; and takes away from them, as well as from the rest of mankind, every silly pretension to a divine or very distant origin. He exposes to them the signal favours they had received, and reminds them of the marvels operated for them, of which they had themselves been witnesses. It is not to their merits these are attributed, but to promises made to some of their ancestors for the happiness of future generations. To them he spares not the bitterest reproaches on their stiff-necked indocility. In the face of so many prodigies their frequent disobedience is no less extraordinary than the miracles themselves. It is no less singular, that a nation should have preserved with so much veneration a book which bears such hard testimonies against it, and which places the great body of the people in the rank of the most vile and most detestable of men. All these singularities are as marvellous, and as contrary to the common workings of the human mind, as the miracles which Moses reports are incompatible with the common laws and order of physical nature. At least, if Moses, like some other legislators, the better to subjugate his people, and to make his laws received, had deceived an ignorant nation by illusive prodigies, he certainly did not flatter it on its origin; and for the times anterior to Abraham, he could have no interest in falsifying the traditions commonly received. These traditions are confirmed by those of two nations yet existing, the Tartars and Arabs, separated from one another by immense tracts of country, and which, like the Jewish nation, have alone preserved their races without mixture. With the first of these the people to whom Moses addressed himself never had the smallest intercourse or relation.

(b) Page 284.

Mr. de Maillet, or Telliamed, who has left us many valuable observations on the formation of valleys, and on the concretion of stony substances, and whom, though Mr. de Buffon has borrowed much from his ideas, it must be observed, he never mentions, is a striking example how far a man of sense

fense may be misled by systems. Seduced by his aquatic system, and by the productive powers of water, he at last seems to have really persuaded himself that men might have been originally fish. To support his system Mr. de Buffon asserts, that all the highest chains of mountains are situated towards the line, and in the direction of the equator, or at least deviating only 23 degrees from it; and, to confirm it, caused maps to be drawn by Mr. Buache. These are made for the system, and not for the globe. In fact, as the Abbé Rosier remarks, so far from the highest eminences of the earth lying near the equator, the most immense known plains are situated either under it, or on each side of it. In Africa the deserts of Nigritia and superior Ethiopia, the sandy plains of Caffreria, of Monemugi, and Zanguebar; from its eastern coasts to the Sunda Islands, a sea of 1500 leagues; from the Moluccos and New Guinea to Peru, an ocean of 3000 leagues; and another from America to the western coasts of Africa, occupy the torrid zone. The two high mountains of Cimboraço and of Pitchinqua under the line are only an exception without consequence, as the great chain of the Andes, instead of running in its direction, stretch almost directly south. The immense plain between the Orinoco and the river of Amazons is a further contradiction to this assertion. All the great chains moreover diverge from the equator either to the north-east or to the south-west. If it is admitted that the axis of the globe was inclined at the deluge, many great chains will then appear to have been, at the first creation, either under the line then concentric with the zodiac, or not more than 25 degrees diverged from its direction. In that case, the present formation of mountains would not so greatly militate against the supposition of this great naturalist, that the centrifugal force must not only have elevated towards the equator the general surface of the earth, but have occasioned its highest protuberances to run in that direction. According to my ideas, however, as the greatest part of the surface of the earth was overturned and dislocated at the deluge, very little of this former very probable arrangement can now be expected to appear. In fact, we must always force the real truth to bend it to this supposition. Even by changing the position of the poles 23 degrees, the Alps, mount

Krapack,

Krapack, the Caucasus would still be found too distant; whilst the high mountains of Canada and Norway, the elevated platform of Siberia, and of the desert of Chamo, would yet swerve still more from the equator. In his first writings Mr. de Buffon, with much more ingenuity, has destined the highest mountains, whose greatest chains cut the equator obliquely in diverging 25 degrees, to be the counterpoises which balance the two continents. Thus we see does this philosopher forcibly bend all nature to his predetermined opinions. He is no less apt to suffer himself to be deluded by the observations favourable to his system, sent to him by subaltern candidates for the honour of being named in his writings. On such grounds he roundly asserts, that the whole chain of the Vosges is composed of granite, or of hard free-stone. It may be so on the side of Lorraine; but I can answer for it that in Alsace, in the part of the great chain from St. Odille to the Banc de la Roche, the whole of those mountains, from their feet to their summits, are formed of a stone composed of large and small pebbles cemented by a coarse sand. The Banc de la Roche is alone of granite; after which, in the principality of Salm, the same nature of rock begins again. In that branch which runs from Phalsburgh to Schirmeck, and to the Donau, including that mountain, the highest of all the Vosges, excepting a few quarries of purer and finer red, or reddish sand stone, and some interspersed of lime stone, the same remarkable kind of rock presents itself everywhere. From the like unfaithful reports, he affirms that the mines of St. Marie aux Mines have been worked to the depth of 200 toises below the level of the Rhine: he should have said, no doubt, 200 toises below the entrance of their shafts on the high mountain of Giromani, far removed from the Rhine. The levels or drains which have been made to draw off the waters from those mines are yet, as I was well informed in the country, far above the roots of that mountain. These mines are in great part abandoned, because the expence of making new drains, as yet very practicable, would exceed the probable profits. No fire engines have ever been employed; which, however, must have been necessary, had the works been ever pushed a single inch below the level of the plain, or of the river many miles distant.

distant from the mountain. Many more instances might be adduced of spurious or doubtful observations, boldly alleged as proofs of his system.

(c) Page 291.

This assertion of Mr. de Buffon is not only not warranted, but seems contrary to the general fact. The famous mines of Potosi, in which, at their first discovery, so much native silver, in great masses, was found, are not situated in the high mountains themselves, but in lower mountains, which may indeed be said to belong to them; but are isolated from the highest ridges of the Andes by intervening valleys. The mountain of Hartz, in Lower Saxony, and those in which silver mines are found in the duchy of Saxony, are not 400 toises high. The mines of Hungary are not in the high ridges of mount Krapack. Though hilly, there are no high mountains in Cornwall, so famous for its tin mines. The lead and copper mines of Derbyshire are in calcareous mountains, not 150 toises in height; and this latter metal is found in many parts of England, in plain and level countries. Mr. de Buffon could not deny that no inconsiderable mines of gold and silver are worked in Siberia; but yet he affirms that gold and silver are almost the sole property of equatorial climates, for the single reason, that in these are found the highest mountains; yet it appears that in these same southern regions native gold in great abundance is not only found in hilly or mountainous, but in plain and level countries. In 1771 the Spaniards, in an expedition against the Indians, found the richest mines of gold yet perhaps discovered, great quantities of which appeared even on the very surface of a plain of 14 leagues extent, at Cineguilla in the province of Sonora. So great was the harvest, that before the end of that same year those hitherto desert and uninhabited plains had attracted 2000 workmen. Other rich mines of the same metal were found in the province of Cinalao. Vide Robertson's Notes to his History of America. The whole of these provinces, part of the kingdom of New Mexico, is, however, without mountains, and even distant at least 200 leagues from any high mountain. The great veins of gold and silver ore are not always incased, as this author asserts,

asserts, in the perpendicular fissures of mountains. Those of silver in the mines of Hartz are so nearly horizontal as only to incline 10 or 12 degrees. The principal veins of lead or copper ore are, I apprehend, always either horizontal or very little inclined. They are sometimes suddenly broken off by rocks, which have slipped down lower into some deep cavern, and have carried down under them the hopes of the miner to unknown depths. To recover the lost vein, either shafts must be sunk lower, if that part of the mountain with its various strata has sunk down perpendicularly; or levels must be carried on either on one side or on the other of this intervening wall of separation, in case the bed of ore has only been shoved out of its direction by the lateral slip of the vein with its superincumbent strata in that particular part of the mountain. The surest chance to recover the vein, is to seek for it at some distance, at the same depth, and in the same direction as it was found before the interruption. These are the occasions of great uncertainty in the profits of these mines. Owing to similar dislocations, great lumps or isolated bodies of ore are sometimes found, which delude the miners with the hopes of finding a continued vein of equal richness. All these accidents prove the interior as well as exterior convulsion and dislocation, which almost all mountains have experienced since the creation of the earth, and for which the change of centre of gravity, and consequent subversion of great part of the earth, which I am persuaded took place at the deluge, sufficiently account.

(d) Page 305.

This was contrary to the then established opinion, which was, that icy seas were sure indications of lands; and hence it was supposed, that a vast inaccessible continent lay under the antarctic pole. But from Captain Cook's observations it appears, that if northern shores are frequently surrounded by ice, it is not on the account of the proximity of land, but on account of the shallowness of the beach which environs it. Wherever the shore is steep and the sea deep, there is no more solid ice than in open seas in the same latitudes. The great deposits carried into the adjoining sea by those

those mighty rivers the Oby, the Janisea and Irtysh, by rendering its coasts much shallower than formerly, are the probable causes that the navigation, by coasting round to Kamchatzka, possible according to some accounts one hundred years ago, is now become impracticable by reason of ice perhaps now eternally fixed to the bottom of these shallower coasts. There is probably no land under the antarctic pole, but the sea that surrounds it is so shallow, that in latitude 72 the ice is every where adherent to the bottom, and precludes all possibility of further navigation.

(e) Page 314.

The whole difference, says Mr. de Buffon, in the vitrification of vitreous and calcareous bodies is, that the first are capable of immediate vitrification, whereas the latter must first be calcined before they can be melted. Calcareous stones, says he, may be finally reduced to glass by the heat of burning glasses. Mr. D'Arcet melted calcareous spath without the addition of any other matter, in a fierce furnace, and by mixing vitreous matter with calcareous it may be melted in the more ordinary furnaces. Mr. de Buffon has appeared on many occasions so very ready to admit the truth of every light experiment which has been offered to him when favourable to his system, that we may reasonably require fuller proofs before we admit the certainty of these facts. Extraneous matters so often imperceptibly alter the processes of chemistry, that we have a right to demand frequent and careful repetitions invariably offering the same results. In the first case, what was melted was perhaps mixed with some substance foreign to the calcareous matter; in the last, where a distinct menstruum is added, the entire fusion may be very possible. The different airs created by intense heats, the decomposition of salts or of particles of the vessel in which the experiment is made, may in both cases have served as menstrua.

(g) Page 322.

The whole of the great chain of Mount Jura is calcareous. On its
3 D summit,

summit, the beds of its calcareous rocks are perfectly horizontal, split by perpendicular fissures, and frequently assume the appearance of regularly built castles. As the hills fall on each side, these beds become inclined, and towards the foot of the mountain are frequently found in an absolutely perpendicular position, particularly towards its more abrupt face looking into Switzerland: if all these beds were formed by deposition, these last as well as the former must have been originally in an horizontal or nearly horizontal situation, and must have been displaced by some convulsion. The stratification of rocks, whatever be their nature, is to be concluded from the parallelism of their veins, whatever may be the situation, horizontal, inclined, or vertical, of their masses. We see in Mr. de Saussure's description of Alpine mountains, laminated rocks of granite, vol. ii. page 5; rocks of the same, thick strewn with mica in parallel lines, page 50; the stratification of granites parallel with beds of laminated rocks throughout the whole height of Mont Blanc, page 85. Pudding-stones in vertical beds, incrusting in a cement of schisteous matter composed of very thin laminæ parallel with the position of the pudding-stones, could not have been originally formed in that situation, but must have fallen into it by some accident. A frequently repeated succession of these pudding-stones, of slates, of free-stone and of calcareous rocks, mixed or unmixed with mica, all in the same direction, prove that all these several beds have been at one and the same time deranged from their original position to be set upright. Page 100.

(b) Page 323.

Over and above the several examples cited, it may not be amiss to point out some of the numerous instances given in the above author's travels in the Alps, of the frequent intermixture of laminated primitive rocks, which bear the most evident marks of formation in water, indifferently lying under or over other rocks of a more compact substance, and both of these intermixed with others of calcareous or what is called secondary natures. Of the perfect amalgamation of these two pretended distinct matters, and of the frequently imper-

imperceptible gradation from one to the other, he gives many instances which prove that before they subsided they have all floated together in one common liquid, which could not be fire, the certain operation of which would have been to have confounded them all into one solid mass. Under the needles of Chamouni we see solid granite gradually declining into laminated rocks, and frequently great tables and sometimes knots of the former enclosed in these. The southern needle itself is composed of a great variety of rocks. In one place is a stratum of granite enclosed between two others of grey rock of a very different nature. The same bed is here of pure granite, and there of this grey stone. Farther on appear transversal veins of granite, and sometimes knots of it enclosed in that same distinct substance:—the whole in strata strongly marked in a nearly vertical position. This, the author observes, can only be explained by crystallization in a fluid which had kept distinct substances suspended in its menstruum, when accident determined their elements to unite in greater abundance in this or that part. Vol. ii. page 69 to 80.—Imperfectly formed granites becoming gradually more perfect, enclosed within very thin laminated horn-stone, prove the first to have been formed in the same manner as other rocks. Page 86.—In the mountain of Valorine pudding-stones are found interposed between primitive and secondary substances; and these two qualities of matter gradually changing from one to the other, slates by degrees becoming free-stones, and *vice versa*, shews that the sediments of which they are composed were sometimes pure, and at other times mixed with mud, with sand or other matters. Page 104.—The free-stone and pudding-stones of primitive mountains have a cement of quartzeous matter, whilst that of the secondary rocks is generally calcareous. I know not whether this will demonstrate the prior date of the former; but, as the author remarks, it will shew, that at the time of their formation the waters were not then and in that place impregnated with calcareous sediments. Page 107.—Mr. de Sauffure thinks, with respect to calcareous bodies called secondary, that slates, and such rocks as are of a blueish or blackish colour, mixed with mica or quartz, must have been formed before that revolution which gave to mountains their present

form, and which deranged their beds from their original position; but that gypsum and calcareous stones of a more porous texture are of later formation. Page 119.—By analysing, this naturalist found a small quantity of calcareous matter in crystals of feldspath. The rock on which these crystals are formed is a laminated stone mixed with quartz, with horn-stone, and threads of amianthus. This amianthus is in great quantities between the beds to which these crystals adhere, and is often mixed in various directions in the body of the crystals. Page 123.—Beds of free-stone mixed with rounded pebbles are alternately and repeatedly intermixed with beds of calcareous stone. Page 179.—Calcareous strata mixed with laminæ of a ferruginous quartz, and others with mica. Page 187.—Free-stone mixed with pebbles of primitive nature, upon which are strata of pure free-stone whose cement is calcareous, and over these slates, on the summit of Mount les Fours, at the height of 1396 toises. Page 192.—Quartz rock sprinkled with mica, between beds of slates deemed of secondary formation. Page 286.—Strata of calcareous fragments mixed with mica and filtrations of quartz. Page 271.—On the col de la Seigne, two very pointed pyramids of calcareous stone mixed with mica. Page 275.—In the same mountain, parallel and alternate strata of slates and of quartz, which prove, says the author, that nature ceased not to produce primitive rocks after having formed secondary ones. Page 276.—Gradual transition from schisteous rocks to pure granite. Page 290.

(i) Page 324:

The ancient quarries of white marble of Paros and Antiparos, exhausted by the Greeks and Romans, are filling again with calcareous stalactites of the purest white. Mr. Monnet however assures us, that these islands are entirely composed of what is called primordial matter or granite, and that the waters filtrating into their caverns apparently pass not through any calcareous rocks. Mr. de Buffon and Mr. Pallas assert, that all high mountains are of vitrificable matter. Probably those they had examined were of that nature; and, as the abbot Rosier remarks, every one forms his system
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on that part of the earth only which he has seen, and concludes without hesitation that every other must resemble it. Mr. de Saussure, whose researches on mountains have been more perseverant than those of any other naturalist, assures us that some of the highest mountains in the Alps, and those in their very central parts, are of calcareous rocks. He also observes, that wherever these are joined on to vitrifiable rocks, the two substances are so perfectly blended together as to make it impossible to determine any line where the one ends and the other begins. He also remarked, in several places, calcareous stones forming in vitreous rocks by the exudation or filtration of waters through what is called primitive rocks.

Mr. de Caroff and Mr. Macquer assert, that calcedony grows not only in the solid body of gypsum in the mine itself, but even in specimens of that calcareous substance preserved in their cabinets. Those flints which are so frequently disseminated on the surface of chalky grounds, are very apparently concentric concretions from that matter, formed under the atmospheric influence by filtrating waters combining with it phlogiston, acids or alkalis. The purest flint, though ranged by naturalists amongst primitive substances deemed by them of an entirely distinct nature, has probably no other origin. The gradual and imperceptible transitions from primitive to calcareous rocks, so frequently observed by Mr. de Saussure, are strong evidences either of their coeval formation or of their convertibility. Experiments daily shew us, that from various processes the most essential alterations are operated on many substances; and hence we must conclude that the qualities of matter may be entirely changed, either by the loss of some component principles, or by the accretion of others; or by both. From Dr. Watson's Chemical Essays it appears by analysis, that, of 100 parts of slate, 46 are found to be of flint, 26 of clay, both deemed primitive materials, 8 of magnesia, 4 of calcareous earths, and 14 of iron. When heated red hot, the slate loses 2 parts; but, when held in combustion a longer time, nearly one-tenth of its weight. But, notwithstanding the small proportion of calcareous earth, the calcined slate reduced into powder is acted upon with great

great violence by acids, and, put into water, forms in a few days a strong lime water, and deposits, as other lime water does, an earth which effervesces with acids. Here is a conversion of the whole remaining substance, after the evaporation of one-tenth, into calcareous earth, whilst it originally contained only one 25th part of that matter. Hence it appears to me evident, that what philosophers are pleased to call primitive substances, and calcareous bodies by them denominated secondary, both equally of original creation, are mutually convertible by the chemical processes of nature.—From all these circumstances, it seems not unfair to presume that calcareous substances are probably composed of the minutest and finest particles of all terreous matter, not excepting vitrifiable matter, which either at the creation, or within the antediluvian seas, or at the deluge, being longer suspended in the waters, were the last to be deposited by them; and that they are also sometimes composed, and continue to be formed from the dust and finest particles of grosser vitrifiable substances, detached from these by waters, or deposited by their filtration through superincumbent beds of substances which naturalists have been pleased to call of primitive formation, in contradistinction to all calcareous bodies, which they indiscriminately declare to be of second formation, and the sole product, as Mr. de Buffon and his disciples contend, of the exuviae of testaceous fish.

(k) Page 325.

Mr. de Saussure observes, that in all mountains where the position of their strata is horizontal, or nearly so, they are divided and split by fissures perpendicular to the horizon; but wherever the situation of their strata is very much inclined, or nearly perpendicular to the horizon, then the fissures parallel to each other form nearly right angles with that situation, and are nearly horizontal. In the first case, it shews that the strata have preserved their original direction; in the second, that it has been changed. Had the strata been formed in a situation nearly perpendicular, it would have been impossible that they should have uniformly split in directions contrary to the efforts

efforts of gravity and pressure. That the fissures should frequently be neither absolutely perpendicular to, nor parallel with, the horizon, is easily to be accounted for; as in their primitive situation their direction might in many cases be considerably altered by the inequalities or variable solidity of the basis on which they rested. In their violent precipitation from their original horizontal to a vertical position, the strata may have also frequently suffered new cracks, which often sub-divide the rocks into parallelopipeds.

(l) Page 332.

Some years ago I planted about 40 acres of ground chiefly with Scotch fir: the soil was so barren that the farmer found it useless to attempt to produce corn on it; nor would it cover with grass; he therefore willingly yielded it at one shilling per acre during his lease. Though the plantation is yet young, it is now covered underneath with luxuriant grass. The fall of leaves and branches cannot as yet have produced any considerable addition; but it is probable that trees attract and draw from the atmosphere, fire, salts, and nitre, which have invigorated the earth.

(m) Page 333.

In the earl of Carlisle's mines in Cumberland, the coals are enclosed in calcareous rocks; in those of the earl of Lonsdale at Whitehaven, they are closely adhering to a schistuous rock. In the country of Liege, the different bands of coal are divided by a kind of rock which Mr. Gennete calls agas, from the filtrations of which he assures us that new beds of coal are regenerated in many parts in the space of 40 years. Mr. de Genfanne thinks that coals are generated from mixed argillaceous earths impregnated with bitumens and sulphureous principles. Mr. Gennete, from ocular inspection, gives an account of 61 beds of coal worked in the mountain of St. Gilles near Liege, to the depth of 4125 Liege feet. Mr. de Buffon, who cites at length his description of these veins, assures us, though he never visited them, that only 23 of them can have been worked to the depth of

4288 feet. The case, I apprehend, is, that one of these authors computes the depth from the summit of the mountain, whilst the other reckons it only from the entrance of some shaft on its side. Mr. de Buffon assures us, that the deepest pits in Europe are those of Namur, which have been worked to the depth of 2400 feet: those of Whitehaven, the deepest in England, he looks upon as comparatively shallow. But if by depth is meant, as it certainly should be, the lowest point to which men have penetrated in mining under the general surface of the earth, I will venture to say, that the mines of Whitehaven are the deepest which have been worked for any mineral in any country. Some shafts are drove from the summit of the hill above them, which is not elevated more than 40 fathoms above the level of the sea; but the great entrance into these mines is at the bottom of this hill, and descends gradually by a road wide enough to admit carts to the depth of 100 fathoms more; and these mines extend under the harbour and sea a quarter of a mile to that depth under the level of its waters. Whatever may be the depth taken from the shafts on the tops or sides of hills far advanced in the land, I believe no other mines are worked in any country so much below the level of the sea itself.

(n) Page 334.

In moor lands, where coals are generally found, gullies or deep holes in the form of inverted cones are frequently to be seen. These with the waters must frequently convey the exuviae of plants through their subterraneous passages into the bowels of the earth. Where the moors are left in their wild state these tunnels are yet to be found; but, for the purpose of cultivation, or to avoid danger, are in general filled up by the industry of man. Such certainly must have been much more frequent from the numerous cracks and fissures opened at the deluge, or when the surface of the earth settled to its present state; through which the remaining waters would find a passage into the caverns of the earth, and carry with them the spoils of numerous plants, very different from those that now grow there in the altered state and temperature of the globe.

(m) Page

(o) Page 335.

The rocks below Bristol Hot-Wells, whose strata, inclined in an angle of about 45 degrees, dip under the river Avon on each side, thus leaving a passage for it, speakingly proclaim to the eye of the numerous visitants of that place the same effects of a violent convulsion, which has thus dislocated these rocks, as well as those of Derbyshire, and, in fact, of every other mountainous country, even where the rocks and mountains infinitely surpass these in height; though in such vast extents these effects are not so easily to be followed.

(p) Page 341.

Many local evidences give, in fact, the greatest reason to think that the Black and Caspian seas, and the lake of Aral, are only the remains of one sea formerly much more extensive, and comprehending them all three. Not only on their immediate borders, but to very great distances northward, up the courses of the Don, the Wolga, and Jaick, these three seas are surrounded by flat and sandy deserts, destitute of fresh water, but interspersed with innumerable small lakes, whose waters are salt or bitter. The plains of Cuban, stretching between the Black and Caspian seas, and those that lie between this last and the lake of Aral, and far towards the east of that lake, bear still more evident marks of having been once covered by its waters. All these deserts are strewed with shells belonging to fish of similar kinds with those yet found in the Caspian. The author of a Dissertation on the primæval Form of Europe, inserted in the second number of the Monthly Magazine, asserts to have traced in his travels the ancient extent of this former interior sea over the whole desert of Astracan and beyond the Jaick, by the symptoms of coast with which the elevated plains of Russia border this desert, and by the fossil productions covering its whole surface. He also observes, that Guillaume Le Vasseur ascribes the same appearances to the plains of the Boristhenes. Other travellers have remarked the traces of sea in the plains of Asia Minor and of Persia, and

along the Danube very far above the actual limits of the Caspian and the Black sea. Before the rupture of the Bosphorus, this formerly great interior sea, re-uniting the three above-mentioned seas, would have no other bounds towards the north-east and east than those which the gradual rising of the lands in Russia and in Great Tartary would give it; and as this is very gentle, its waters would of course cover great tracts of those flat countries. Towards the north and north-west it will have extended itself over considerable parts of Polish and Russian Ukraine. Towards the south in Europe, the chain of mount Krappack will have been its barrier; but turning round this in Wallachia, it will have formed a great bay in Temeswar and Lower Hungary, hemmed in towards the north by this same chain of mount Krappack, towards the west by the hills which separate Hungary from Austria, whence it would receive the Danube, and to the south by the chain of mount Hæmus. In Asia, the formerly connected rocks of the Bosphorus and the various branches of mount Caucasus would form its southern barriers. The whole of this southern boundary is so strong, that it could not be broken through in any other part than where the present freights are situated. By the former height of these last-mentioned mounds before they gave way, the extension of this great interior sea northward and eastward must have been determined. Over and above including the three seas which still remain, it probably covered great part of the country of the Usbeck Tartars, the governments of Orinburg and Astracan, and the Cuban in Asia: in Europe, the plains of Little Tartary and Crimea, of the Russian and Polish Ukraine; Moldavia, Wallachia, Lower Hungary, Servia, Bosnia, and Bulgaria, would be under its dominion. This sea, diversified in Europe by several islands formed by intervening mountains, and generally shallow towards the north, west, and east, would consequently be of great extent. Probably from the above circumstance, and the then existence of several lakes in Greece and Asia Minor, Europe originally bore the denomination of the Isles of the Nations.

(q) Page 343.

This opinion was generally founded on a dissertation of our learned countryman Mr. Hales, who in about 1750 published an essay, in which he argued, that evaporation being sufficient in the Caspian sea to absorb the surplus of waters poured into it from the great river Wolga, and other considerable rivers, without any other visible drain, the Mediterranean presenting so much a larger surface to evaporation, without receiving a supply of waters in proportion with its extent, must be recruited from the ocean. I remember to have read at the time this publication, and to have thought his reasonings very ingenious, but not conclusive. Not having the work, and having tried in vain to procure it, I cannot now pretend to follow all the arguments therein adduced. The Caspian sea, circumstanced as above mentioned, is the foundation of his calculations on the balance of receipt and evaporation, applied to the Black and Mediterranean seas. The Black sea is avowed to have a surplus of water which it discharges into the Mediterranean; but it is contended, that this latter must be recruited from the ocean, from whence the general currents run inwards, though I believe it is allowed that one single current runs outward. With respect to the Caspian, though it has no river flowing from it, yet it is not perfectly sure whether it may not have some subterraneous drains. Experienced English mariners, who navigated that sea in the reign of Peter the Great, asserted, that in some parts of it were found great whirlpools and vortexes, by which they supposed its surplus waters might have a subterraneous vent into the distant Persian Gulph; and, to confirm this, remarked, that several kinds of reeds and willows, common on the borders of the Caspian, are found floating in great quantities in that gulph, on the shores of which no such plants are seen to grow. To confute this, Mr. de Buffon wrote to the Academy of St. Petersburg, to know whether any such whirlpools had been discovered in the Caspian: its answer was in the negative; whence he concludes the certain falsity of this assertion. It is to be remarked, however, that, since the time of those navigators, that sea has not been frequented

by any other than very inexpert Tartar mariners from Astracan, who barely coast it from thence to Terki, and sometimes from this last to the nearest Persian coasts. Their testimony, as never venturing into full sea, is consequently of little weight. But, setting aside this very dubious question, let us observe, that the Caspian is by its situation in a very different predicament from the Black or Mediterranean seas. It lies in a very inland situation, distant from every sea, and, as well as the lake of Aral, is on all sides surrounded by thirsty sandy deserts, which, instead of supplying it with superabundant moisture, must drink up much of its waters. From the very nature of a vast extent, of more than 200 leagues to the east and of 100 to the west and south, of circumambient sandy soil, dews and rains must be very scanty in an eastern climate naturally dry. Great part of the moisture which evaporation draws from the surface of that sea, which in such a climate must be very considerable, is waisted to a distance to fall on these thirsty deserts, never to be returned into its bosom. In all the tracts of country bordering on the Caspian to the south and east, rains are very uncommon, and fresh-water springs almost as rare as in the deserts of Africa, though salt springs are very common, which rather prove a suction of its waters. The few scanty rivers of its eastern boundaries are dried up and lost long before they reach its borders. In consequence, it is the Caspian sea alone which, either by the evaporation from its surface waisted to these burning regions, or by subterraneous ducts, supplies them with the little water they have. No wonder then that it stands not in need of any visible drain, notwithstanding its ample receipts from the north. There is also great appearance that its extent is daily, though slowly, diminishing. The antients represent it as much larger: from a comparison of the surveys and charts taken of it at the beginning of this century by order of Czar Peter, and since by command of the reigning Empress, it should seem to have considerably diminished. The Wolga daily extends its sands into it; and all its borders are very shallow and grown up with reeds. But, to ascertain this point, a less interrupted knowledge of that great lake, and perhaps greater accuracy, would be necessary.

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The Black sea, it is on all hands agreed, discharges a surplus of its waters; but it is contended, that evaporation on the extended surface of the Mediterranean exhausts much more than all the supplies it receives, either from thence, or from the great rivers which are disembogued into it, added to the rains falling into its bosom, necessitating thereby a further constant supply from the ocean to maintain the equilibrium of its waters. It appears to me, that all these receipts from the Black sea and from the great rivers must be under-rated. The supply from the former, independent of the rains falling into it, must be much more considerable than has been calculated. The Danube, the Dniester, the Don, and Cuban, pour into it the collected superabundance of waters, from an extent all around that sea northward, westward, and eastward, of at least 200 leagues of very rainy countries. The Nile carries into it the tropical rains of Abyssinia, which in their passage cover the whole land of Egypt for several months. The Po, the Adige, and the Rhone, collect in their courses all the abundant rains and melted snows of the Tirolian Alps not carried into the Danube, and more than one half of those of the Alps of Switzerland. The great rivers of Spain throw into it the waters of the southern Pyrenean mountains, and of two thirds of that whole kingdom. The generally dry coasts of Asia, and of the Barbary states, afford but a small proportional supply; but upon the whole it should appear to me, that the sum total of these receipts should nearly, if not fully, equal the evaporation from the surface, though very extensive, of that sea. But it above all seems to me, that Mr. Hales must have greatly undervalued the quantity of rain falling into its own bosom. I think it evident, that wherever that quantity is not more than sufficient for evaporation on any given considerable extent of the earth, it must produce barren sandy deserts, as in some parts of the interior of Asia and Africa.

Taking the length of the Mediterranean, exclusive of its narrower parts towards the streights, from the medium longitude of the eastern coasts of Spain, 18 degrees from the isle of Ferro to the coast of Syria, it will contain 35 degrees in length, upon an average of seven degrees in breadth, presenting a surface

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of about 4800 square marine leagues. As it is well known that in some parts of Italy as much rain falls in a year as in any other part of Europe, yet considering that much less falls on the opposite more southern and sandy coasts of Africa, we will suppose that only 18 inches of rain fall in a year upon a general average on its surface. It will surely be allowed that 18 inches on such a number of square leagues must form of itself, independent of the receipt from rivers, an ample fund for evaporation even in that climate. To prove that it does, let us take into consideration a tract of land under the same latitudes, from the coast of Syria in longitude 53 to longitude 88. It will include all western Asia Proper, part of Desert Arabia, all southern Persia, and a part of northern Indostan. No one can imagine that more rain falls in a year on that surface of the continent than on the bosom of the Mediterranean: on the contrary, there is every reason to suppose that much less does fall. In that extent of land very great tracts of sandy deserts are found; owing, no doubt, originally to a deficiency of rain and dews. On these level countries the rains wafted thither from other parts, falling on their thirsty surface, sink immediately so deep into the earth as to be in great part beyond the reach of being pumped up again by the most ardent rays of the sun, to form new clouds or reservoirs of dews. Yet upon the whole of this extent the quantity of rains and dews falling is not only in balance with evaporation, but, after supplying a sufficiency of water for all vegetable and animal life existing within that compass, affords a considerable surplus, which is carried off into the sea not only by the lesser rivers falling into the Mediterranean, but by the great rivers Tigris and Euphrates, by the Hyftaspes and Indus, and a great number of rivers flowing between these two last. It will be remarked with justice, that evaporation is much stronger from a watery surface than from land; but let it also be remembered, that not a drop of water falling into water is lost, but is pure addition to it; whereas much of the water falling upon land sinks too deep, by numberless ducts, into the bowels of the earth to be again exposed to evaporation: no inconsiderable quantity is also absorbed for the nourishment of plants and animals. Hence, and from the analogy of an extent of land equal to the Mediterranean, in a much drier climate,

climate, affording a very great surplus over and above what is carried off by evaporation, I conclude that Mr. Hales's calculations must be erroneous; and that the quantity of rain falling into the basin of the Mediterranean is at least fully adequate to the annual evaporation from it; and that therefore all the additional supplies it receives from the Black sea, and from the great and lesser rivers falling into it, must afford a superabundance of waters, which must finally be carried off into the ocean, instead of the Mediterranean requiring, as it has been supposed, a constant influx from the ocean to keep it replenished to its present level.

I have heard it asserted, that no superior current runs from the Mediterranean into the ocean; but in a chart published in Germany during the siege of Gibraltar, in which the tides and currents in the Straights are laid down, it appears, that, whilst a strong current drives from the ocean into the Mediterranean along the coasts of Africa, a contrary current sets into the ocean from that sea, turning round the point of Europe into the bay of Gibraltar, and, sweeping round that bay, takes its course along the coasts of Andalusia. According to that chart, the whole Straights may be divided into five bands, in all of which the tides are different. In the middle channel the tide coincides with that of the ocean; in the two bands on each side, the hours of flow and ebb are different from that of the ocean, and different from each other; in the two bands following the two coasts, the hours of tide are the same, though different from all the others.

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The narrative of Mr. Deslandes runs thus: "The direction of the currents, which is north north-west, following exactly the bearings of land, forced me to lay-to between the capes Gonsalves and St. Catharine in the gulph of Guinea. The usual winds in that quarter are from south south-east, south south-west, and south-west. I waited two months and a half in the useless expectation of a change, making daily efforts to gain the coasts of Loango, where I had business. During this time I observed, that the sea ran in the above-mentioned

mentioned direction, at the rate of from half a league to a league an hour, and that at certain depths the currents ran counter beneath with equal velocity. By the following method I ascertained the depth of these different currents. Being laid-to in eight fathoms water, I hung a plummet to a line, to which, at about two fathoms from the lead, I tied a napkin by the corner. Letting fall the lead into the water, then exceedingly clear, I saw it immediately taking the direction of the first current; in sinking the line I perceived that this current had no longer any influence on it, and stopping there, the napkin floated indifferently round the line. Here, therefore, there was a suspense of currents. Dropping the line one foot, it took a direction directly contrary to that which it had at first taken. Marking the line at the surface of the water, I found this was at three fathoms distance from the napkin; whence I concluded, that, of the eight fathoms of water, three ran to the north north-west, and five in a contrary direction to the south south-east. Repeating the same experiment the same day in fifty fathoms water, at six or seven leagues from land, I was surprised to find the column of the superior current deeper, and in some proportion to the whole depth. On fifty fathoms water, I estimated twelve or fifteen to run in the first direction. This circumstance, however, was not constant during the whole two months and a half, but took place at intervals for a full month of that time. During the intermission, the whole current seemed to drive into the gulph of Guinea. In consequence of these observations, I made a machine of volume sufficient to try the experiment on my sloop, by letting down of which into the inferior current, I succeeded to balance the effect of the contrary superior current, joined to that of the wind. Materials were wanting to try it on the ship.—This is the modest account of this officer, who proceeds to reason very sagaciously on the probable causes of these contrary currents in this gulph. This information was sent to Mr. Buffon, on hearing that he had asserted that no such contrary inferior currents could exist in the Streights of Gibraltar. This great master's answer is, that this only shews that there may be partial exceptions to his general rule; but that, notwithstanding, it is no less certain, that it was the ocean

ocean that first opened itself a passage and still runs into the Mediterranean. I support this opinion, adds he, not only on the currents running into that sea from the ocean, but on the correspondence of the strata on each side the streights :—as if this latter circumstance would not equally exist in the case of the Mediterranean having forced a passage into the ocean.

(s) Page 349.

Diodorus of Sicily asserts, that the Euxine sea was formerly a great lake, whose waters, increased by length of time, had at last broken down the mounds which retained them, and had forced themselves a passage in the first instance near the Cyprian islands, and finally through the Hellespont. Strabo tells us, from the authority of Strato, that the Euxine had formerly no outlet near Byzantium, but that the great rivers which discharge themselves into it with violence had at last forced an opening, and from thence flowed into the Propontis, and from this last opened a passage through the Hellespont. He says, that the same thing had happened to the Mediterranean, and that being swelled by a great number of rivers (and no doubt by the recent influx of waters from the Euxine), it had opened itself a passage near the columns of Hercules into the Atlantic; and that, by this great discharge, great tracts of land which were before covered with water now first appeared. This seems confirmed by Aristotle, who informs us, that great part of the Peloponnesus was yet covered with waters at the time of the Trojan war; those, no doubt, which had been left in hollow places; and that they were not entirely drained off until his own times. Hence we may conclude, that before the opening of the streights of Gibraltar, the waters of the Mediterranean were not only not lower but higher than at present, and that this height was momentarily increased much above its former level by the discharge of the Euxine sea. It was by the rupture of its mounds near Gibraltar, that the island Atlantis, situated beyond them in the Atlantic ocean, was, according to Plato, overwhelmed. This is a strong proof, that the idea preserved by tradition was, that the Mediterranean had forced a passage into the ocean, and not that the ocean had forced its way into the

former. All the Grecian historians speak of two deluges having happened in Greece, those of Ogyges and Deucalion, the latter of which they have confounded with the general deluge, though not having taken place, even according to their own chronology, 1400 years before Christ. It is possible, though I should rather imagine the first great rupture of the Bosphorus anterior to both these Grecian deluges, that it might not have been entirely completed till the days of Deucalion, whose deluge is by them represented as the most important and destructive. The lesser one of Ogyges may have been occasioned by the breaking down of the mounds confining the lake which Herodotus supposes to have formerly existed in Thessaly. The irruption of so large a portion of the waters of the Euxine, whether completed at once or at two distinct periods, must naturally be supposed to have made great ravages on many parts of Greece, formerly perhaps connected with Asia in those parts where numerous islands now remain. Whether connected lands or islands, they would certainly suffer much from such an overwhelming torrent, and the inhabitants would generally perish. Deucalion and Pyrrha may have remained alone on the remnants of some land or island which resisted this explosion, and may naturally have thought themselves alone in the world; whence the Grecians attributed to this particular deluge all or most of the circumstances handed down by previous tradition as belonging to the more antient universal deluge. The ruins of lands or islands overthrown by this disaster not improbably formed other islands, now existing in the Egean sea, and very possibly either entirely raised or greatly increased the isle of Crete, which directly faces that sea, and the torrent issuing from the Bosphorus. Still existing monuments of nature seem to confirm this event. Petrified human bones are found, not in small but in very great numbers, incased in the solid rock, or heaped together in subterraneous caverns, opened by the works carried on to improve the fortifications of Gibraltar. Their petrification proves them to be of very antient date, and that the substances of which the rocks are composed, formerly in a loose state, when unexposed to the influence of salt water and air, have had time to be

hardened into stone by their joint operation. They are probably the remains of the inhabitants of the islands and destroyed lands of the Archipelago, and of the various coasts of the Mediterranean, swept away by the sudden irruption of the Black sea, and conveyed thither, not by the waters of the then uninhabited coasts of the ocean, but by those of the Mediterranean driving in a strong current against these former lands, violently attacked, but not yet perforated by the accumulated weight of this new torrent. If such is, and it is surely probable, the origin of their deposition, it will confirm with history that mankind existed some ages before the opening of the streights of Gibraltar, and that it was not the ocean which forced open those former barriers, but the sudden weight and impetuosity of a great superabundant body of waters pressing against them from the Mediterranean.

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Modern philosophers have in like manner thought proper to attribute the rupture of the streights of the Baltic, and the inundation of the present basin of that sea, to the efforts of the ocean. To conceive this, we must either suppose that the basin of that sea, which, though not very deep, is greatly below the level of the surrounding lands, was at one time nearly of the same height with these, and in that case the inundation would have been only temporary; or that the lands now forming its basin were at the very instant of the irruption of the ocean sunk to their present depth in order to retain them. If, on the contrary, it always presented the same depth below the surrounding countries, and was towards the ocean separated from it by higher lands, it either must have been originally left full by the waters which, at whatever period, once covered the whole earth, or, if those were by any subterraneous accident withdrawn, must have filled again, by the waters of all the rivers of the surrounding higher lands of Germany, Poland, Russia, Sweden, and Denmark, to the full height of its lowest banks. These rivers are as numerous and as copious as those that flow into the Black sea; and it surely will not be pretended that

evaporation in that cold climate could exhaust this immense receipt. The observations of the Swedish philosophers for more than 150 years past tend to prove, that this sea, instead of receiving any increase from the ocean, is constantly, though slowly, growing shallower; no doubt by the gradual deepening of its conducts into the ocean. Professor Wallerius, who had also adopted this generally received opinion of the formation of the Baltic by an irruption of the ocean, furnishes himself a strong argument against it. He says, that the oldest Swedish historians, no doubt upon the faith of antient traditions, affirm that formerly their whole country, except its mountains which then composed a group of islands, was covered with water. If this was in any degree true—and the yet nature of many of the countries surrounding the Baltic, Holstein, Mecklenburg, Prussia, Livonia, and Finland, furnishes strong evidences that these at least were once so covered—the Baltic, instead of being an empty basin, must have been filled with waters to a much greater height than at present. Linnæus and Celsius, in the *Amanitates & Alta Academiæ Sueciæ*, observe that the two very tall mountains of Torshus and Hoburg in Gothland, formed of calcareous rock, were marked and hollowed out by the force of the water, at the same time that all Gothland lay immersed in the sea except these two mountains, which raised their heads out of the deep in the same manner and with a similar appearance to the Carlsöe islands in their present state. They add that the sea-ports of East and West Bothnia and of the eastern side of Gothland are every year decreasing in depth, and that the inhabitants of West Bothnia have observed by marks upon rocks that the sea decreases every ten years above five inches. This no doubt is effected by the gradual deepening of the straits which carry off the Baltic waters into the North sea. Professor Pallas observes, that as soon as, from the marshes of Ingria forming towards the Baltic a sort of gulph of low lands, you begin ascending the elevated soil of Russia, antient traces of the sea occur at every step: at first in a soil intersected with ravines which has visibly suffered by the flowing-off of an enormous mass of waters: afterwards in calcareous beds, which can only result from the deposits of a sea

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at rest : first occur, strata of deposited earth mingled with blocks of granite detached from their original rock ; then, vast banks of rolled pebbles and of gravel mixed with fragments of calcareous stone, of petrifications broken or changed into flint, and even of bones. A like subversion of the original strata, and especially of the calcareous beds, has been observed in the environs of lake Onega, where those mountains begin to rise which join the Laplandish and Swedish Alps. These traces of the sea may be observed in all the lands contiguous to the gulph of Finland. It almost seems sufficient to dwell upon the map with an intelligent eye, in order to be convinced that the great number of lakes between this gulph and the White sea—that the islands, rocks, and broken coasts of these regions—are effects of a deluge which there sought an outlet.—*Acta Acad. Petropolitanae*. Traditions handed down to us by the Greeks give room to think, that if this sea did not at one time communicate with the Black sea, its southern borders approached at least much nearer to it than at present. Diodorus records from antient traditions, that the Argonauts sailed from the Euxine up the Tanais, and that, after a short passage by land, they found rivers which carried them into the Northern sea and thence into the ocean, from whence they returned through the streights of Hercules to Telamon. The story is no doubt improbable, but it shews that there existed formerly an idea, that the Euxine sea was once not very distant from the Baltic. The antient name of Pontus, or the great sea, given to the Euxine, may also denote that it was once not only of much greater extent, but joined or nearly joined to the Baltic. This idea of the Euxine being the great sea must have arisen from times preceding both the Argonautic expedition and the siege of Troy. In those days, the Grecians were too well acquainted both with the extent of the Mediterranean and Euxine seas to imagine, that the latter surpassed the former in magnitude. Whilst the Baltic remained a closed sea, Mr. de Buffon's pretended balance of evaporation and receipts cannot, on account of the cold climate in which it is situated, be admitted ; and therefore it must have been the superabundance of its waters which at length forced a passage into

into the ocean ; and thence we may infer, that it is most probable that the streights of the Mediterranean, as well as those of the Baltic and Black sea, were opened by the weight of their own increasing waters, and not by irruptions of the ocean. The same may probably be conjectured of the formerly interior Red sea, and of the Persian gulph, the former of which was antiently called the Lake of Reeds.

(u) Page 352.

Though from the plain reasoning above alleged it is evident, that these northern regions could not have enjoyed the happy climate Mr. de Buffon has bestowed upon them either 5000 or 8000 years ago, yet I have no doubt but that before the deluge, both from the different position of the whole globe itself and from the very different aspect of its then surface, as I shall hereafter explain, they might boast of a much more temperate climate. Even many centuries after the deluge, previous to the rupture of the streights of the Baltic and of the Bosphorus, I apprehend the climate in particular of northern Europe and of the parts adjacent, of Asiatic Tartary and Siberia, was much less cold than at present. It is well known, that the vicinity of sea greatly tempers the cold, which would otherwise affect countries situated in high northern latitudes ; and that it is greatly increased where they are, as is the present case of Siberia, surrounded on all sides by a very extensive continent. When both the then interior seas, the Baltic and the Black sea, were of double and probably much more than double their present dimensions, when on one side the former covered all the adjacent low-lands of Germany, Prussia, and Russia, now intersected with stagnant waters much colder than those of the sea, and on the other the latter extended itself not only towards the north, but to the east, as far as or beyond the lake of Aral, it is evident that all the intervening countries betwixt these perhaps in some places nearly approaching seas, as well as Siberia, whose southern borders were then washed by the Black sea, must have felt a much less degree of cold. Though the latter is, by its central position in the midst of the whole continent,

continent, a high country, it was then much less elevated above the level of the waters of the Black sea, now much sunk below its former height; and we know that it is from the level of the sea that we are to compute that elevation which gives the proportional degrees of atmospherical cold. Hence the neighbouring mountains, from a moister air, were less covered with snows, and that for a shorter time. All these circumstances would concur in rendering the cold of these northern regions much less severe than at present. These parts, consequently more susceptible of cultivation, were then probably much better peopled by the sons of Gomer, of Gog and Magog, than they have been since; and this will account for the frequent ruins and traces of habitations in parts now almost desert. When a large proportion of the waters of the Baltic and Black seas was drained off by the rupture of their respective mounds, these countries would become daily colder, and the northern nations, as soon as the lands deserted by the Black sea became sufficiently dry to be habitable, would willingly abandon their former abodes, now become intolerably cold and barren, to come further south. Accordingly we find in Herodotus, that the Scythians had not inhabited the banks of the Danube, the borders of the Black and Caspian seas, more than 1450 years before Christ. The rupture of the Bosphorus might, I think, probably happen in the days of Jacob, and have been the occasion, by the inundations consequent to it, of the seven years famine in Palestine and Egypt, mentioned in his time, and about the time which the Grecians have affixed to the deluge of Ogyges. The sudden influx of so vast a body of water would undoubtedly inundate much of the coasts of Africa, Asia, and Greece; and we accordingly find recorded in history, that the Peloponnesus and Attica did not recover the inundation caused by the deluge of Ogyges for 200 years. But as soon as the straits of Gibraltar were opened, and it would probably soon follow, those waters would be not only drawn off, but the Mediterranean itself would be sunk below its former level, and thus more completely extend all the shores of that sea, and amongst other circumstances greatly lessen the depth and extent of the interior sea which covered the Delta of Egypt, which

which was not, however, completely elevated above the actual level of the sea, till after the days of Homer, by the deposits of the Nile, diverted from its former course through Libya by subsequent Egyptian industry. Before the opening of those streights, as history records, not only the Delta but great part of Egypt was under water, from which the district of Thebais alone, as Plato tells us, rose an habitable island. The sudden irruption of such an immense body of water, and its no less sudden discharge, would, no doubt, occasion many other important changes on the surrounding coasts, and more particularly on those exposed to the first fury of the torrent. It probably broke down the mounds which formerly, as Herodotus tells us both from tradition and natural indications, upheld the lake which antiently covered the valleys of Thessaly in Greece, and of Menander in Asia Minor. The uninhabited state of these fertile countries, and particularly of the latter, some centuries after the era we have mentioned, strongly indicates the ravages which that event must have occasioned. The deserted state in which Dardanus found the coast of Phrygia, which I have shewn to have most probably happened not more than 1120 years before Christ, and the like situation in which about the same time the Cretan emigrants in the days of Minos found the coasts of Caria and Lycia, at a time when the interior parts of Asia and the neighbouring kingdom of Lydia had long been fully inhabited, shew both the reality and extent of the ravages made by these repeated accidents. In the vicinity of such great population, those fertile and delightful countries must have been long before filled with inhabitants, had not such a catastrophe suddenly swept away its former owners and left them deserts at so late a period; for late it still would be, though we should admit the Grecian chronologies, which only date their colonization three or four centuries sooner.

(*) Page 355.

Mr. de St. Pierre in his *Etudes de la Nature* maintains, that the only great and general currents of the ocean are alternate, from the southern pole

pole to the northern, and from the north to the south, and these occasioned by the alternate melting of the ice and snows accumulated during their respective winters under the poles at the approach of returning summer. His argument is supported with great ingenuity; but facts strongly contradict it. On this supposition, it would be during our summer that the great current would proceed from the arctic pole, whilst in winter the current would run from the antarctic: but, on the contrary, so greatly is the general current of the Atlantic from the north increased during our winters, whilst the ice is accumulating in the arctic and melting in the antarctic, that it is well known that navigation from Europe to all parts of North America is entirely cut off; and that, even by gaining the West India islands, it is impossible to make way against the current by coasting along the American shores. In the American war, our army at Boston was reduced both to distress and entire ignorance of what passed in Europe, by our fleet destined to carry out provisions having lost by a few days the season of its passage. This circumstance was predicted to me at the time by a naval officer, who, hearing the fleet was not sailed before the middle of October, said it would probably never arrive at its destination. Even in summer, ships from northern Europe must make the Canaries or Azores islands before they can gain their passage to North America; which shews a constant current from the north driving more particularly in summer along the coasts of Europe, and in winter along the coasts of America. Governor Pownall assures us, that there exists a partial current which, even in winter, will carry ships directly from England to North America. But this is probably a return of the great current driving from the north along the coasts of Europe, which is carried northward in the middle of the Atlantic towards the point of Newfoundland, where it joins and increases the impetuosity of that which sweeps southward along the shores of America.

(y) Page 358.

Mr. de Volney and Mr. Bruce, in opposition to Mr. Savary (who had in

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support of his opinion, that the Delta of Egypt had been gradually raised from the sea, alleged traditions from ancient authors, that in former times a much less quantity of water was sufficient to overflow and fecundate Egypt than at present), justly, I believe, contend, that this is founded on a mistake, and thence triumphantly assure that the Delta is no new land. The measures of the nilometer seem to have been at all times kept as a mystery, the knowledge of which was reserved to government; and it is very probable that these authors also supported their opinion of the raising of the Delta on a mistake, occasioned by different measures used at different times in calculating the height of the inundation in the nilometer. In fact, the quantity of rain falling in Ethiopia, which produces the waters of the inundation, was probably *communibus annis* nearly the same antiently as at present. But the general equality of inundation necessary to fertilize Egypt in the earliest times as in the most modern is no proof that the deposits of the Nile had not, when the whole of its stream was directed into that course, filled the formerly interior sea that covered the Delta, or do not even now continue gradually to raise not only that fertile spot but the whole valley of Egypt. The mud of the Nile not only raises the level of the plains of Egypt, but also the channel itself of the Nile; and that being equally raised, the same quantity of water will be sufficient to overflow the adjacent country: the only difference will be, that the inundation will thence extend itself further inland on each side; or, when that is precluded by hills or mountains, carry its deposits, as it has done, further into the sea, and thus insensibly prolong the continent. In all parts of the world, the earth washed down by torrents from the hills in the first instance raises the beds of rivers, before it is accumulated into sand beds at their mouths, or spread over the adjoining plains by their inundations. Mr. Bruce, in his account of the nilometer, shews that a foot or two are constantly allowed for the accumulation of mud within it, and that the height of the inundation is only calculated from that point.

(z) Page 365.

In 1751, when I visited Mount Vesuvius, no great eruption had happened since the year 1736. At that time I descended above 300 yards into its crater. Within, it was then a plain of about a mile in diameter, entirely formed of, or at least incrusted with, sulphur hard enough to walk upon; from whose multiplied cracks smoke issued, and which was every where sufficiently hot to damage the shoes. Near the middle of this plain of sulphur rose a conical mount, somewhat exceeding the exterior borders of the crater in height, through whose hollow tunnel continually issued volumes of smoke, and, at about the interval of two minutes, torrents of ashes, pumice-stones, and fragments of rocks, which either fell on the sides and augmented the conic mountain, or dropped back into the mouth itself. We attempted to see whether any side of it was accessible, but found that the stones fell indifferently all around it. On one part of this plain we were shewn the sunken remains of a former mouth. It was then a cavern, about 8 feet deep, into which we descended, with the caution of observing the intervals of emission of thick smoke, which issued in puffs from a lateral furnace resembling that of a glass-house, on whose sides we gathered flower of brimstone in the shape of large mushrooms. In 1752 this immense cauldron boiled over, and the weight of matter broke down one of its sides, from which issued torrents of melted lava. By this, and the frequent eruptions which have happened since, the whole face and appearance of the volcano have been altered; as well the whole crater I then saw as its conic interior mount have been overturned, and a new inferior crater and mouth have been formed, and changed with every new eruption.

(aa) Page 371.

Switzerland, Alsace, part of Suabia and of the Palatinate, the countries of Triers and Mentz, are shut up between chains of mountains, on the sides of which the vestiges of water are every where visible. These

mountains have but very strait passages for the courses of the Rhone, the Rhine, and Danube. We need only figure to ourselves these passages closed to a certain height to conceive all the low grounds circumscribed by the Alps, Mount Jura, the Vosges, the Ardennes, and Black Forest, inundated and becoming a great lake. As well the present narrow issues of all these rivers in parts of their course through almost joining rocks, as the sides of all the valleys and lakes contained within these mountains from Geneva to Coblentz, bear the visible wave-worn marks of a much higher level of their waters. From the narrow country of the Vallais, the Rhone seems as yet to work its way with difficulty through almost closing rocks. This probably formed a separate lake whose issue was, as yet appears from traces on those rocks, much more elevated. The passage of the Rhine was probably once shut up at Basil, as well as that of the Rhone near Geneva, to a height much more elevated than their present courses. Mr. de Luc and almost every philosopher have observed the evident traces of much higher waters than at present, on the rocks which afford a narrow passage to the Rhone near Geneva, on those through which the Rhine flows near Basil, and lastly near Coblentz. The rocks bordering the lake of Lucerne every where shew the most unequivocal traces of its waters having been once many toises higher than at present. The rocks which bound the vale of Alsace, exteriorly composed of coarse sand-stone mixed with pebbles even to their tops, plainly manifest that their outward coats have been formed and deposited by waters which once filled the enclosed valley almost to their total height. This lake, which I shall call the Lake of Switzerland, would be, however, interspersed with a very great number of islands formed by interior hills and mountains, and would have no other communication with that which covered Alsace, the Palatinate, and the valleys of Germany in Suabia, the countries of Triers and Mentz, than by the present lake of Constance. From this great lake the Rhine would only issue near Coblentz, and the Danube in Suabia, there forming considerable cataracts. On the, I think, probable supposition of the present narrow passages of all these rivers, closed to the heights which are indicated on the rocks

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through which they now have free passage, it would be curious to form a map of this once great sheet of water. For this purpose it would be necessary, first to take the height of all these numerous traces of higher waters visible on the rocks which border the lake of Lucerne, and which would, I dare say, be equally recognized on the sides of every valley, as well as on the flanks of exterior and of interior mountains. Whatever shall be found below that level will have been part of this antient lake; whatever rises above will have been its banks or islands rising out of it. On the model in relief which General Piffer has made, of about 20 leagues round Lucerne, it would be easy to verify part of the effect. As already mentioned, the rocks which border the lake of Lucerne bear the most evident traces of a higher level of its waters. By closing on this model the passages of all its mountains, to the height which those water-marks should fully justify, we should have at once the certain level of this great lake which once covered the valleys of Switzerland, and consequently all the lower countries which border it to the north; the extent and height of which in those parts might be again verified by the traces of water on the rocks which leave a narrow passage to the Rhine near Coblenz. This river not having yet forced a passage near Basil, we should see this lake, after having covered great part of Switzerland, turning to the right over the lake of Constance to inundate the valleys of Suabia; and sweeping round the Black Forest, which would form a peninsula, cover behind it the long vale, enclosed on one side by the western flanks of that mountain, and on the other by the Vosges and Ardennes as far as Coblenz; from whence it would have its principal issue by the Rhine. How far it might extend on the right-hand side of the Rhine within that space must be determined either by the mountains or the rising of lands towards Bavaria, whence the Danube must have offered another outlet to its superabundant waters, as the Rhone must have done on the side of France, from a passage which still-evident marks shew to have been once much more elevated than that which it has since visibly forced. The central height of this great lake might be easily determined on the above-mentioned model of General Piffer,

Piffer, a work of equal ingenuity and curiosity, on which the proportional height of all the mountains comprehended in it from the present level of the lake of Lucerne is accurately delineated, and the mountains themselves composed of the very kind of rock which principally constitutes them. To a philosophical eye the inspection of this curious model is alone worth a journey to Lucerne.

To give examples, in the new continent, of similar appearances of former lakes no longer existing, it may not be amiss to quote some observations of Mr. Thomson, Secretary of Congress, on viewing the passage of the Potomac river through the blue ridge forming one of the long valleys closed to the north and south between several parallel ridges of the Virginian mountains. They have been already transcribed by Dr. Hutton for a different purpose. The broken and rugged faces of the mountain on each side of the river; the bed of the river for several miles below, obstructed and filled with the loose stones carried from this mound; in short, every thing on which you cast your eye evidently demonstrates a disrapture and breach in the mountain, and that, before this happened, what is now a fruitful vale was formerly a great lake, which might have here formed a mighty cascade, or had its vent by the Susquehanna, where the blue ridge seems to terminate. Besides this, there are other parts of this country which bear evident traces of a like convulsion. From the best accounts I have been able to obtain, the place where the Delaware now flows through the Kittatinny mountain, a continuation of what is called the North Ridge, was not its original course, but that its passage was through what is now called the Wind-gap, several miles to the westward, and above an hundred feet higher than the present bed of the river. This Wind-gap is about a mile broad, and the stones in it such as seem to have been washed for ages by water running over them. Should this have been the case, there must have been a lake behind that mountain; and, by some uncommon swell in the waters, or by some convulsion of nature, the river must have opened its way through a different part of the mountain, and, meeting there with
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less obstruction, carried away with it the opposing mounds of earth, and deluged the country below with the immense collection of waters to which this new passage gave vent. There are still remaining, and are daily discovered, innumerable instances of such a deluge on both sides of the river, after it passed the hills above the falls of Trenton and reached the champaign. On the New Jersey side, which is flatter than the Pennsylvania side, all the country below Croswick hills seems to have been overflowed to the distance of from ten to fifteen miles back from the river, and to have acquired a new soil by the earth and clay brought down and mixed with the native sand. The spot on which Philadelphia stands evidently appears to be made ground. The different strata through which they pass in digging for water, the acorns, leaves, and sometimes branches, which are found above 20 feet below the surface, all seem to demonstrate this.

Dr. Hutton thinks this statement and view of things far from corroborating that sudden convulsion conjectured by the judicious observer from so many concurring testimonies. His system requires him to reject all such; and he here sees nothing but the rivers gradually excavating the several valleys between these parallel ridges, and conveying their spoils during an infinity of ages through these gaps to the sea. It is rather curious to find an author confidently quoting such apparent marks of a convulsion, either sudden or such as might be effected in no great length of time, as proofs of an infinitely slow degradation. It seems he should at least have shewn the impossibility or improbability of lakes having once filled those valleys. But no; the author is himself convinced, and sees not the necessity of convincing others. Such is the very natural fascination of predetermined system. It is said that some small part of the rocks forming the fall of Niagara has lately tumbled in. The violence of such a stream rushing over them, and that corroding power of waters so frequently the theme of Dr. Hutton, may certainly from time to time detach one fragment after another, and thus, in a few thousands instead of millions of years, level down this great barrier without occasioning any material damage in the sub-
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adjacent countries. Earthquakes have not been experienced for many years in those parts; but soon after the French first settled in Canada, very tremendous ones were felt. Dr. Hutton will then allow it possible, that an earthquake may even at once effectuate the destruction of the whole mound which now sustains lake Erie. It is devoutly to be hoped that such catastrophe may not take place, as in that case lake Ontario and the river St. Lawrence would be so swelled as to overflow all the countries around them, to the probable destruction of their now numerous inhabitants. But should this head be, either gradually in the course of many centuries, or by convulsion at once, suddenly disrupted, it is evident that the lake above it, and all the great western lakes communicating with it, would be successively or instantly drained either of the whole or of great part of their waters. Their beds would then exhibit either much diminished lakes, or valleys, in a short time not unfruitful, traversed by one or more rivers. In a certain term of years, no other natural proofs would remain of the existence of former lakes than such traces as are now discoverable in the passages of the Potowmac and Delaware rivers, and in the countries below them. Such surely may be the very natural fate of every lake suspended high above the general level, without the necessary intervention of millions of years. In times immediately subsequent to the deluge, when all nature was yet in the full paroxysm of convulsion, it is more than probable that such unrecorded accidents did happen; and to such many actual appearances must be referred.

(bb) Page 372.

From the observations I have made, particularly on the ascents of Mount Jura from Franche Comté, the basins of many formerly-existing lakes are very likely to have been frequently mistaken for the remnants of volcanos by those philosophers who, prepossessed with the idea of finding every where their traces, have without hesitation adopted them as the craters of ancient eruptions. Extensive level plains, although in a circular form, surrounded by moderate eminences broken down in one part only, and
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that always towards the descent, present, however, very different aspects from the mouths of volcanos. On this ascent of Mount Jura many of these of various extent, but less spacious towards the summit, are to be remarked one above another. The breaking down of the mounds of one of these uppermost lakes would necessarily occasion the rupture of all the lower reservoirs thus suddenly overcharged, nearly, as it appears to have happened, in the same direction. I do not know that there are any volcanic appearances on the sides of these basins; but, if there were, it would not exclude their formerly being filled with water, which their remarkably level bottoms without any tunnel-like appearance clearly indicate. In the neighbourhood of so much water favourable to the kindling of volcanic fires, earthquakes may have contributed to break down their banks. That assistance seems, however, neither necessary nor probable, from the above-mentioned similar direction of the ruptures. These delightful oval or circular meadows, encircled by sloping banks covered with wood, repeated at various stages, form the most beautiful and pleasing variety I ever beheld. I have no doubt but many such emptied basins of former lakes, very natural to have existed after a general inundation, and to have disappeared from the consequences of various accidents at various times, are frequently taken for volcanic craters by those who have adopted the system of formation by fire. The attribution of many of these to water excludes not, however, frequent and undoubted indications of volcanic fires. The multiplicity of waters in the early periods succeeding the deluge make these but the more probable, and both are likely to have then existed in countries where neither lakes nor volcanos now remain.

(cc) Page 373.

Mr. Monnet in his Mineralogy assures us, that a great cavity filled with water, when a certain gallery in the mines of Sainte Marie aux Mines in Alsace was abandoned, was found, after 50 years when that gallery was again opened, filled with transparent quartz. As Mr. de Buffon informs us, there is a species of earth on the Pharo of Messina which petri-

fies with astonishing rapidity. To form it into mill-stones, no other operation is necessary but, after having cleared away about two feet of soil, to knead the under-stratum and form it into the shape required, and then cover it loosely again with the same soil. In a year's time the mill-stone is found perfectly hardened. The hardness of coble and pebble stones occasions them to be generally looked upon as stones of very ancient petrification: this is, however, often not the case. In the dried bed of a torrent in Italy, I remember to have gathered in a short time, as I walked along it, a number of specimens of pebbles of very different degrees of hardness and formation—from that which still received the impression of the finger, or easily crumbled when pressed, to that degree which surpasses the hardness of most other kinds of stones. These new-moulded pebbles, frequently intersected by veins of different colours, perfectly resembled others in the completest degree of induration. Clays, thus rounded and gradually hardened, are easily to be found in the bed of every torrent exposed to be sometimes filled with waters, and at other times laid dry. The petrifying qualities of many waters are too well known to be insisted upon. One instance of the abundance and minuteness of stony particles contained in waters, and of the celerity with which they superinduce a stony incrustation, is worthy to be recorded. It is mentioned by Mr. Dietrich, the late philosophic mayor of Strasburg, and inserted by Mr. de Buffon in his Natural History of Minerals. By the ingenious management of the waters of Santo Filppo on the mountain Santa Fiora near Sienna, Doctor Leonardo Vegni has contrived to take off the impression of medals and bassi relievi, by incrustation; even casts have been taken from bustos, and he hopes at length to be able to take off whole statues. Any porous substances may be impregnated both inwardly and outwardly with these sediments; and if the animal or vegetable substance which serves as a mould should decay, the remaining concretion will appear a true petrification of the body itself, though it has really been only incrustated, interiorly as well as exteriorly. If woods or shells are thrown into these quickly-accumulating concretions, they will be as completely petrified within them, as we sometimes find such substances

stances in fossil bodies. By a dissolution of fernambuco wood, the doctor gives various colours to these petrifications. Thus these great interpreters of nature cannot help acknowledging the extreme promptitude of her actual processes on a small scale, whilst they disavow the possibility of a like celerity in her primæval powers of concretion on a larger; because it would militate against their favourite system, of slow operations during an infinity of ages.

(dd) Page 376.

It is well known that artificial stones, perfectly resembling in appearance and solidity Portland stone, have been long fabricated in London. Variegated alabasters, jaspers, and agates, are crystallized at Ashbourne and other places. The art of man has not yet been able to give their genuine lustre or solidity to the imitations of diamonds and the finer precious stones; but all other kinds of stones are imitated to a degree of perfect deception by a hundred artists in every part of Europe. Shall plastic Nature in her fullest vigour, the goddess whom some philosophers alone adore, or the omnipotent God of Nature herself, require thousands and ten thousands of years to complete the originals, however greatly they may surpass the imitations?

(ee) Page 377.

The crystallization, or what is called the vegetation, of lead in water by zinc is but lately discovered. Sugar of lead in water is so powerfully and quickly attracted by a piece of zinc, that in a few hours the whole forms a beautiful arborization pendent in the bottle from that matter. Such crystallizations are also effected by fire. Mr. Ferber observes, that various short crystallizations are formed in the empty bubbles of the torrents of lava, cooling on the superficies whilst yet in violent fusion underneath. Diamond-like crystallizations are likewise formed in it, though much inferior in hardness, in regularity, and brightness of colours, to real gems which are crystallized in water. When the whole earth was yet a liquid pulp

swimming in every kind of menstruum, actuated upon by the great mass of universal light, and when dry land appeared, by the full force of its ruling sun, how can we suppose that these same laws of nature in their fullest vigour should require thousands of years to crystallize or coagulate the various substances of which we see it now composed? What these watery menstrea did not effect, frequent volcanic fires—natural in the first great fermentation of matter, either immediately after the creation or after the deluge, when its exterior coat was nearly reduced to the same situation—might well bring to perfection during the first four centuries, when men were yet confined to a narrow spot. That at this last epoch its whole exterior surface was convulsed, dislocated, and dissolved, every monument of nature amply testifies. God had said that he would destroy not only the whole impious race of men but the earth with them; and he afterwards promises Noah that there shall not be another deluge—"dissipating," according to the literal words of the Hebrew; according to the Samaritan version "scattering," or "dispersing;" translated by the Greek "to corrupt," or "disfigure," and by the Syriac and Arabic "to destroy" the earth; that is to say, since the body of the globe remained, its outward form and surface.

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER V.

Various Opinions on the Nature of Light, Heat, and Fire.

SIR,

AFTER having in my preceding letter laid before you the celebrated system of Mr. de Buffon, and the several opinions of many other modern philosophers tending with him to prove not only the high antiquity of this globe, but the numberless ages required to elaborate and consolidate its component parts, and to fashion its actual structure; and having given you with freedom my reasons for dissenting from their pretended irrefragable proofs of this thesis; you will give me leave, previous to any further discussion on that subject, to say, with extreme diffidence, a few words on the nature of Light, Heat, and Fire. On this head natural philosophy, as yet in its infancy, is very undecided, and has produced a number

ber of discordant opinions. It is, however, a point which appears to me of great importance, and by no means indifferent for the settling of our ideas, both on the original and actual formation of this earth and on the continued operations of nature. On this difficult subject, I shall rather produce the different opinions of others than presume to offer any fixed sentiment of my own. Heat, Fire, and Light, have till very lately been generally looked upon as one and the same matter, proceeding from one and the same cause, distinct only in degree—fire generated from heat, and light from fire. All three, however, appear in many instances perfectly distinct, and discriminated by various and frequently opposite effects. The source of all three has been generally placed in the sun, or at least that body has been looked upon as their great magazine; but on this too there are different opinions.

It is on the basis of fire first existing in the sun and purloined from thence by other bodies that Mr. de Buffon has laid his system. Having once kindled and fixed it there as in its seat, he imagines whatever relics remain of it in our planet to be no other than a slackened portion thence originally derived. As we have already seen, he considers not heat, fire, and light, deemed only different degrees from one and the same cause, as a distinct element from his sole vitreous substance. They are, according to him, purely generated from, and the effects of, pressure and friction. By their operation, without the intervention of any other distinct matter, the sun

was put and remains in fusion, and became a liquid mass of glass producing heat, fire, and light. The possibility of these emanating from his vitreous matter by mere pressure and friction we have already noticed, and left to his more sagacious disciples to explain. Had he allowed fire to be a distinct though yet inactive menstruum, the agency of pressure and friction might have given motion to a more subtle interspersed element, and have communicated it to a naturally inert and solid mass immersed therein; but without such intervention we cannot conceive pressure to have any other effect but that of consolidating. We have seen that this author imagines the earth and other planets to be portions of this liquid fiery mass, which, whilst their parent sun continues in full vigour of fusion, have darkened and cooled, and are still cooling by degrees. The centre of our globe is still burning, and he asserts that the greatest part of the heat yet experienced on its surface proceeds from thence, and not, as was generally supposed, from the sun. Adopting the calculations of Mr. de Mairan, he determines this heat to be at present 31 times greater than that communicated by the sun; but as the centre cools it will gradually diminish, till at length the whole surface of the earth will become frozen and incapable of preserving animal or vegetable life. Mr. de Mairan's calculations are founded on a scale of degrees between extreme cold and extreme heat, applied to the unvaried temperature of the caves of the observatory at Paris, much greater than that of the air in times of frost. The heat of their atmosphere is constantly at 10 degrees of de Reaumur's

Reaumur's thermometer, and Mr. de Buffon asserts, that at equal depths the same will always be found in the waters. A late experiment of Mr. de Sauffure in the lake of Geneva contradicts, however, this assertion; as, at certain depths to be found even in that lake, the heat was diminished to four degrees. In Mr. de Buffon's system, heat must increase as we descend deeper into the bowels of the earth, and accordingly, says he, "the air of deep mines is insufferably hot. It arises from their so much greater proximity to the burning centre." For this, however, more evident and less remote causes may be assigned. The removing of earth, the breaking of stones exciting latent heat and fires where phlogistic matter abounds, the confined perspiration and breath of the miners, and the heat of the lights by which they work, sufficiently account for it. He pretends that the natural and proper heat of the earth is no less proved by electricity. The heat and fire excited by electric concussion prove not, however, an active heat in the substance electrified, but a dormant fire brought into rapid action by the stroke. Electricity is no doubt more easily excited in a body to which some degree of heat is previously communicated; but it will have its effect on all substances susceptible of it in a cold state. Common fire is also brought forth in the same manner. A piece of steel, both exteriorly and interiorly as cold as ice, struck against a flint in the same state of coldness, draws fire from it as well as if previously heated. The cold experienced on high mountains is alleged as proof that much the greater portion of heat proceeds

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from the central fire. At the height of 1500 toises from the level of the sea, the heat is diminished from 20 to 30 degrees. If this diminution proceeds from that further distance from the centre, the waters at equal depths below that level, if the temperature of any such could be tried, would surely be boiling, and those which lay very deep would have at least their proportionable degree of increased heat. The earth and waters under the flattened poles, much nearer to the centre than equatorial lands or seas, should according to this system, notwithstanding the feebleness of the sun's rays and its longer absences, possess a much greater interior heat than those which lie under the equator. Neither are volcanic fires or warm springs proofs of constant active heat in the bowels of the earth. These proceed from other causes, and chemical mixtures will produce the like effects where there was no previous heat or distant communication with it. From all these observations we may, I think, conclude, that the heat of the earth is not occasioned by that of its burning centre, and consequently that Mr. de Buffon's idea is an unsubstantiated reverie.

Before we determine the source and causes of heat, fire, and light, it will be proper to scrutinize their natures and qualities, at least as far as their effects may lead us. Hence we may perhaps resolve whether they are only different degrees and appearances of one and the same element, or are various modifications and combinations of that with other elements. From thence we may possibly

be conducted to divine their original source. In this investigation the observations of the celebrated Swedish professor Wallerius, and of the learned Mr. de Luc of Geneva, will greatly aid us. As they generally agree in principles, it is from the first of these authors that I shall chiefly select such articles as may make you, Sir, tolerably acquainted with his opinions on these subjects.

Fire exists not, says Mr. Wallerius, without a matter proper to receive and maintain it: that matter is the food or aliment of fire which chemists call the inflammable principle, or phlogiston. As fire is always combined with heat, it has been concluded that inflammable matter was scarcely distinct from the matter of heat, caloric matter, or, as Mr. de Luc calls it, the fiery fluid; but they are distinguishable in several circumstances.

1st. The inflammable principle, abounding in certain bodies, as in oils, spirits, &c. may hinder these from freezing, but it cannot liquefy solid bodies. Heat is so fluid and has such force as to liquefy the most solid bodies. The principle of fluidity exists in heat, and without it no fluid could exist.

2dly. The matter of heat is so subtle as to traverse the most solid bodies, leave them and be dispersed without effecting any sensible change in the bodies heated; but inflammable matter cannot be combined with other bodies without contact and mixture, and
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when intimately combined produces a considerable change in those bodies. It requires force to be again separated from them. Calcination and the reduction of metals demonstrate this to chemists. It however of itself abandons liquids in time. The spirit of sulphur loses its phlogiston, and oils, on losing their inflammable principle, become rancid.

3dly. Phlogiston unites itself with difficulty to, and separates slowly from, other bodies; whilst calorific matter, more subtle, easily penetrates the pores of other bodies, and is dissipated with equal facility. Inflamed metals cool promptly, but the inflammable matter remains. These substances are therefore really distinct.

It appears that calorific matter is of a very fluid, subtle, and active nature, and that all natural motion is produced by it; that it is elastic since it acts expansively, and endued with a certain gravity, though imperceptible, which is proved by the successive diminution of heat; for, if it did not gravitate, it would abandon the atmosphere and rise beyond it.

By fire is understood a matter affording light and warmth, which consumes some substances by destroying the connection of their parts; but it can only attack those bodies which contain inflammable or calorific matter. Fire consists in the motion of inflammable and calorific matter; it is always accompanied by vapours and

smoke. Its three degrees are crystallization, incandescence, and flame. Relatively to these three degrees it must be observed, that the heat and force of fire are not proportional to this motion and to these degrees. A heap of straw inflamed is less hot than a pile of wood which burns, but its flame is stronger. The force of fire decreases in ratio of the tenuity of parts, but light is not proportional to the force of fire. It is well known that flame is nothing but burning smoke.

Fire exists not without light, but light may exist without fire; witness phosphoric bodies, and the splendour of the sun often greater in a fine winter's day than in the heat of summer.

The properties of light are ::

Light wants no aliment, no inflammable matter to sustain it. In the concentration of the solar rays, light constantly enjoys the same force without smoke or vapour.

Light exercises its force not only in the whole space of air but also in vacuo. It extends itself to the bottom of the waters, though our eyes cannot follow it so far. Marine animals would not want the organs of sight, if light did not exist in the bottom of the waters. Light penetrates glass bodies without expanding them, and without communicating any motion to their parts. The rays
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of light suffer more or less refraction according to the density of the bodies which it penetrates, but are reflected when they fall on certain hard bodies whose pores are more irregular. Light is then distinct from air, from fire, from inflammable or calorific matter.

Mr. de Luc remarks another most essential and decided difference between light and heat. Light always moves in a straight line. All is darkness around a ray of light admitted into an obscure room. Heat propagates itself in all directions, and progressively.

Light is of a tenuity and subtlety surpassing those of every other matter; it penetrates and fills all space. A 14th grain of light enlightens a sphere of a league in diameter; and from several ships the same lamp is distinguished at the distance of a league. The celerity of its motion is incomprehensible. It moves 968,722 quicker than sound. A proof this of the difference between it and calorific matter, whose motion is progressive and slow. Light has no sensible gravity; the rays of the sun could not reach us, if in the sun they were endued with any force of gravitation.

It has probably no force of attraction, unless it be towards the most subtle, inflammable, and calorific matter, as most analogous to its nature, and containing in themselves something of light.

It is the source of primitive colours.

Light

Light enlightens without changing the parts of the body enlightened, but it re-establishes and vivifies it ;—an effect directly contrary to that of fire, which changes or destroys.

From all these qualities one may conclude that the matter of light is neither inflammable, nor calorific, nor aerial, nor terrestrial, but of a particular nature distinct from that of either.

Mr. Wallerius conjectures, though light itself has no elasticity, that, combined with a very subtle elastic matter, it perhaps constitutes calorific matter ; from this calorific matter, ulteriorly combined with certain terrestrial principles, it forms perhaps the inflammable or phlogistic principle.

Having first established these principles, Mr. Wallerius rises to the consideration of the sun and of its rays. He gives a glance on those systems which contend that the earth was originally a sun, and particularly on that of Mr. de Buffon which makes it a detached portion of the sun. Before he exposes his own system on the sun itself, he remarks in answer to these hypotheses, that no vestige of universal fire is discoverable in this globe, whilst many indications of water shew themselves every where ; that the nature and composition of our earth demonstrate that it never could nor can entirely burn. Its mountains and rocks may be heated and even put in fusion, but they cannot burn or be consumed.

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Our author on the contrary maintains, that there is no inflammable fire in the sun or in its rays. The fire excited by the effect of burning glasses has caused it to be believed, that his rays were scorching; but those rays concentrated occasion not the detonation of nitre; they kindle gun-powder in free air, but not in vacuo. It is not to the rays we are to attribute its kindling in the air, but to inflammable particles contained in the air. Mr. de Luc observes, that if a burning glass is held at some distance from a fire in a room in which the air shall have the same warmth as that exposed to the sun, in order to concentrate the cause of heat, it will produce scarce any effect; but if with the same glass the cause of heat in open air, or the sun's rays are concentrated, the greatest effects will be produced. From whence he concludes that the focus of such glass is not a concentration of the fiery fluid, but the concentration of an agent which has the faculty of disengaging the fiery fluid contained in the substances on which it acts, proportionably to the quantity contained, or to the greater or less force of its adhesion in such body. Mr. Wallerius remarks, that the focus of a burning glass, falling not on a solid body but on free air, produces not the smallest rarefaction, nor occasions consequently the least heat. In the solar rays considered in themselves we find no trace of fire, nor do they produce it but when they meet inflammable matter. The fire excited by the concentration of the solar rays, considered apart from the matter exposed to those rays, is of a different nature to common fire. The same burning glass kindles, without ceasing, all inflammable

ble matters, without losing any thing of its force, because it has no need of food; whilst common fire cannot exist without aliment, and is always accompanied by smoke and vapour.

Common fire is never apparent without the concurrence of solid bodies or of inflammable particles; but the nearer space is to the sun, the more it is disengaged from exhalations and vapours, the more brilliant is its appearance. To conceive the sun burning, we must suppose it supplied with those particles which are necessary for the food of fire. The heat occasioned by the sun is in no wise proportionable to the terrestrial climates, or to the perpendicular or oblique incidence of its rays falling upon the earth, nor to its elevation or declension, nor even to the quantity of rays. That heat varies in the same climate according to the state of the air, the nature of the land, or its elevation above the level of the sea. Before thunder storms the air is filled with inflammable particles, and in consequence the heat is greater. In Siberia, a very high country, the cold is greater at 50 degrees than at Upsal at 59 degrees of latitude. Ice is found at 45 degrees of southern latitude, in similar seasons in which it is not seen at 67 degrees of northern latitude. I shall also observe, that the Bay of Chesapeak, in latitude 38, is frequently covered with ice, whilst nothing like it happens in similar climates in the old continent. Convex mountains receive and reflect more solar rays than plains, their rocks are more proper to concentrate them, but the general heat of their atmosphere is proportional

portional to their height, even under the equator. Mr. de Buffon will tell us, that it is because those mountains are so much farther from the central fire; but can some hundreds of toises make this difference? In that case, we ought to burn some hundreds of toises under the earth, and the waters should boil in the deep and unfathomable seas of Norway. Mr. de Luc shews by the new experiments of Mr. Pictet, that the earth warms not more the air at five feet distance from it than at 50.

From all these observations and reasonings, both Mr. Wallerius and Mr. de Luc conclude, that the solar rays have neither fire nor heat, nor are they the immediate cause of heat. That immediate cause is to be found in the solid particles of calorific and inflammable matters existing in less or in greater quantities in the air, and in all sublunary substances; hence it is that physical climates very frequently coincide not with geographical climates. The solar rays are only the mediate causes of heat; they are the active agents which give the motion to inflammable or calorific particles necessary to produce heat. For this reason, *cæteris paribus*, heat depends on the sun, in so much as it can excite a stronger or weaker motion, more or less durable, in the inflammable particles disseminated in the air.

Mr. Wallerius concludes that the sun is not a burning body, but a luminous and most simple body, part of that light which God created in the first day, composed of particles infinitely minute, sub-

tle, and active; on which all light, all terrestrial motion, and the vigour of all organized bodies, depend.

This abridgment of the systems of Mr. Wallerius and of Mr. de Luc on the sun, and on the causes of heat, will give you, Sir, a sufficient insight into their opinions on these difficult subjects. Certain it is, that by considering the sun and its rays not as immediate but as simply mediate causes of heat, we may explain its phenomena as easily as by the contrary system, and that by so doing we may give reasons for many of its phenomena which remain inexplicable by the last: time and experiments must decide the opinion of the learned. Some late experiments of Mr. Marat favour the above ideas of these gentlemen. How many years were required to root out the prejudice founded on appearances, that the sun turned round the earth!

The Count de Treffan, who has very ingeniously explained all the phenomena of nature by electricity, lays it down as a principle, that vivid or active matter and inert or passive matter are the only two absolutely distinct elements in nature. From matter essentially active flows all motion, which it alone communicates to passive matter in proportion to its combination with it. He contends that this vivid matter is no other than the electric fluid; combined in large proportion with inert matter, it forms phlogistic and inflammable matters. The sun he imagines not, with Mr. de Buffon,

to be a mass of glass in fusion, but to be a solid mass of polished glass, interiorly quiescent, but whirled round its centre with incredible velocity; it is the source of electricity from whence the electric fluid is constantly effluent and refluxent, and whose affinity with terrestrial bodies, already imbibed with the same matter, causes heat and fire.—This idea of the sun's being a solid mass of polished glass is apparently taken from the glass globes first employed to excite electricity, and must be looked upon as a mere fanciful analogy; but, whether the pure active element be light without heat, and only by its combinations with passive matter producing phlogistic or inflammable substances, and thence heat and fire, or whether it be in its own essence the pure element of fire, I apprehend that both the electric and magnetic fluids ought to be considered only as combined and secondary fluids, and not as the primary active element. If the rays of the sun were the pure electric fluid emitted from it, they would be the strongest electrifiers; yet their most forcible percussion does not electrify either the human or other terrestrial bodies. I should on the contrary be apt to think, that the primary active fluid, combined either with salts or some other the most subtle already compounded substances, prepares and forms more or less of these secondary fluids, which are occasionally and locally generated. However it may be of this difference in our opinions, it appears to me that the effluent and refluxent forces which the Count de Tressan attributes to pure active matter—whatever is its essence—whose particles ever in motion and repulsive of each other are in

From the elevation of 1422 toises above the level of the sea to that of 1907 to which that gentleman and his companions attained, they felt when exposed to the sun in a calm day a heat almost insupportable, even when they were motionless, though the thermometer in the shade rose only to 2 : 5, and when exposed to the direct rays of the sun was not raised higher than 4 : 7, above the freezing point on De Reaumur's scale. The most robust of his companions, inured to the heats and colds of mountainous regions, when once they had attained this great elevation, found themselves totally enervated, weak, and feeble, and scarcely able to stand or proceed through excess of heat, though surrounded by eternal snows.—Such is the fact.

This learned observer thinks, that this extraordinary sensation of heat is peculiar and proper to these very high regions. He is persuaded that the heat there excited in our bodies by the solar rays, the extenuation of strength, the beating of the arteries, and other sensations which different persons experienced in this rarefied air, proceed from the considerable diminution of the pressure of the air on the body. This diminished pressure must produce a sensible relaxation in the vascular system; whence it must follow, that the direct heat of the solar rays, tending to dilate the liquors contained in these vessels, and even to detach from them all elastic liquors, must have a very great effect on very high mountains. “We see,” pursues he, “water boil; we see air expand and disengage itself from the blood, under the recipient of the air pump, at a degree of heat much

much less than that which would be required to produce the same effects when these liquors are subjected to the whole pressure of the atmosphere. When then we are elevated to such an height that that pressure is diminished more than one third from what it would be in the plains below, is it not evident that the diminution of pressure must act upon our organs, render their fluids susceptible of greater dilatation, and by these means greatly increase the effects of heat on our frame?"

Notwithstanding all the deference which I have for this able and cautious naturalist, whose decisions seem never influenced either by prejudice, vanity, or the love of system, he will give me leave to discuss this explication with him.

If the diminished pressure of the atmosphere is the sole cause of this disposition of our bodies to be extraordinarily heated by the solar rays at the above-mentioned height, it ought to have an effect, less sensible it is true, but yet proportional, at lesser elevations. But Mr. de Saussure, on the contrary, supposes cold to affect us very strongly some hundred toises lower. Our bodies, however, must at a somewhat less height have the same tendency, though in a less degree. Some other cause must then co-operate to make us feel this extraordinary heat at 1900 toises of elevation, according to his account; beyond all proportion with that which is felt at the height of 1200 or 1400 toises.

Mr.

Mr. de Saussure certainly chose a fine day, calm and serene weather, for his expedition. If he complains not of any remarkable heat the first day, it was because he began his ascent in the cool of the evening, and arrived late at the cabin where he passed the night. At mid-day he certainly would have felt some inconvenience from the solar rays even on the lower Alps, unless particularly counteracted by cold winds. The night was intensely cold; and, for fear of the great cold formerly experienced by Mr. Bourrit by setting out too early, the company set not forward the next day till some time after sun-rise. The presence of the sun was then the principal cause of the strong effects of heat produced on the bodies of the travellers, whilst the earth, scarcely warmed by his rays, remained frozen. A reason must be given for these two opposite effects.

To shew that it is not, as Mr. de Saussure supposes, the less pressure of the atmosphere which alone gives that efficacy to the solar rays on our bodies in such high elevations, I will appeal to the heat equally excited by the sun on organized bodies in the plains whilst the ground is frozen. This even is felt when the agency of that luminary is counteracted by that cause of cold to which this philosopher attributes the impression of cold felt on the lower Alps. In Provence, during the months of March, April, and May, the north-east winds descending from the Alps bring with them the most intense and penetrating cold, which often in April occasions
very

very strong frosts. It is commonly said that these winds are loaded with the icy particles derived from those mountains. They, however, produce neither snow nor hail, and are remarkably dry. Nay, if any moisture is in the atmosphere, these winds immediately precipitate it in rain, which always precedes them. To speak more philosophically, as cold is only the absence of heat, it should be said that these currents of air descending impetuously from these high regions are extremely pure, and little charged with terrestrial, aqueous, or fiery particles; they substitute to the common air of the country an air destitute of phlogiston, and which thence freezes the earth and its plants, which they rob in their passage of whatever heat they possessed. But the sun of this climate ceases not to warm very strongly animal bodies exposed to its rays. Sheltered from the wind, we experience a great degree of heat, and even when exposed to it, if we walk not against it, heat is rather felt than cold; but in the shade and in the house the cold is full as intense as in more northern climates in the midst of winter. There, as well as in all southern countries exposed to currents of air from elevated frozen regions, the passage from the shade to sunshine makes a greater difference on the feelings of the human frame than is produced by several degrees of latitude. The extreme difference between the cold in the shade, and the burning heat of the sun both on mountains and in plains, is exemplified with still greater evidence by the observations of Don Juan d'Ulloa on the climates of America. On the extensive platforms of Peru, elevated to 1940 toises above the

level of the sea, situated under the Cordeleras, and which in the country receive the name of Punas, the rays of the sun excite not only violent but burning heat in the human body, so as even sometimes to cause sudden death; whilst the cold of the air in the shade is capable of causing effects not less dreadful. The sun burns and the shade freezes on the same spot and at the same instant. The same author, on the climate of New Orleans, observes that the heats of summer are more violent and more perseverant than those which are felt under the line or under the tropics. In this same country the rapid succession from heat to cold in winter is not less singular. When the winds blow from the Apalachian mountains and the frozen lakes of the north, the liquor of de Reaumur's thermometer descends to seven degrees below the point of congelation; but, if it changes to the side of the great watery or woody plains of the north-west, it rises the very next day to 17 degrees above that point. Thus the change of the wind in winter produces the enormous variation of 24 degrees in the heat of the atmosphere. Don Ulloa, agreeing with Mr. de Saussure, attributes the cold of the shade in the Punas of Peru, and the sudden changes from warmth to frost in the plains of New Orleans, to the thinness and transparency of the air incapable of retaining the heat of the solar rays. This thinness and transparency of the air he supposes to result on the Punas from their elevation, and in the plains of Louisiana from the cold nature of the easterly winds derived from frosty regions. In this last southern country as well as in Provence it is made evident, that winds
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blowing from high uncovered and dry regions freeze the air and earth in the plains as well as on the mountains, whilst the intensity of the solar rays has a contrary effect on the human frame; and hence it appears that the heat excited in animal bodies, whilst the air and earth continue frozen, is a circumstance in no wise peculiar, as Mr. de Saussure imagines, to very high situations. Perhaps the difference of their sensations in the sun-shine and in the shade may, for obvious reasons, be greater in high and isolated situations; but the effect is only varied in degree.

Both on the mountains and in the plains the small effect of the same solar rays on inanimate bodies, on the earth and air, and their very strong effect on animal bodies, seem to demand a more decided explication. Is it not that heat is more dependent on the quantity of calorific or inflammable particles contained either in the atmosphere or in the bodies struck by the rays of the sun, than on any intrinsic warmth conveyed by those rays? On high situations, particularly on isolated points, the earth and air remain frigid under the most direct rays of the sun, because they contain few calorific particles in themselves, and have few to receive from other bodies. But animal bodies exposed to the sun in the same situations feel excessive heat, because the abundance of calorific particles they carry with them is strongly excited and put in motion by its rays. Such bodies experience a gradual deperdition of vital warmth, and consequently of strength, not only because it is violently pumped from

them by the activity of the solar rays, but because the heat they contain is constantly tending to place itself in equilibrium with the circumambient air. The higher the situation, the more certainly will this effect be accelerated by the diminished pressure of the atmosphere. The moment these bodies are removed into the shade, their internal heat is re-concentred, and their external pores are closed by the cold of the air. In the plains of Provence and Louisiana, whilst the direction and activity of the solar rays remain the same, the heat of the atmosphere varies exceedingly, according to the quarter from whence the wind blows. If from the east, from whence, owing to the nature of the country from which it descends, it is fraught with few calorific particles, the air is cold; if from the west, bringing with it, from low, marshy, or woody grounds, abundance of calorific and phlogistic matter, those same rays putting them into motion and activity excite a considerable degree of warmth. But even during the prevalence of cold air and cold winds, the difference between the shade and sunshine is strongly felt by human bodies as well in these plains as on the mountains. That the effect of the solar rays on these in the same climates will be more considerable in high situations, I will readily admit. In a purer medium, the force of the rays themselves will be greater, and the diminished pressure of the atmosphere must certainly dilate the pores and dispose the internal heat to evaporate more quickly; and thus what in plains only creates inconvenience may, on very high mountains in climates where the rays are very direct, as in Peru,

occasion sudden death. The pores and vessels, contracted by the coldness of an air devoid of calorific particles during the night or in the shade, may be lacerated by the sudden effect of the solar rays violently exciting and attracting all the interior heat of the body. The inhabitants of the plains of Peru, not used to the strong vicissitudes of temperature on the Punas, experience violent head-achs and vomitings, ending sometimes in death; whilst those who are born on them, being from infancy used to these sudden contractions and expansions, are not affected to that degree.

The sensation of cold frequently experienced on the lower Alps at or under 1400 toises of elevation, notwithstanding the activity of the solar rays, remains to be accounted for. Mr. de Saussure attributes it to the cold winds; and it is certainly owing not to the particularly cold temperature of the air, but to the violence of those winds greatly increasing its natural sharpness. Those mountains are in the regions of violent and partial currents of wind which obtain not in higher situations. Under 1400 toises the Alpine mountains are yet in groups. The deep and winding valleys which intersect them in all directions occasion eddies, drafts, and currents of air, which by their impetuosity greatly increase the impression of cold. It is well known that even warm air expelled with violence from the mouth or from bellows has the effect of sudden refrigeration. Under this height, below the region of eternal snows in that climate, the natural temperature of the air is certainly not so cold

as on more elevated points where ice and snow perpetually prevail. But on the latter, above all valleys and above the reach of the violent currents of air they occasion, the usual though colder temperature of the air is not adventitiously increased. In the lower Cordeleras the cold currents of wind, rushing impetuously from their narrow, deep, and winding valleys, frequently occasion the instant death of travellers; yet the general temperature of those parts where snows never lie is very far from being so cold as that of their higher regions eternally covered with ice and snow, though situated directly under the line. On lower mountains the penetrating cold of strong currents frequently overcomes the influence of the solar rays on human bodies. On mountains isolated by their superior height the air, though really colder, is calm, whilst the rays in a purer medium are more active, and consequently have their full effect on our frame.

On the whole it seems difficult to pronounce, whether the rays of the sun are essentially hot and the conveyers of heat, or whether they are only the excitors of heat, by giving motion to dormant caloric particles, or accelerating that of such as are already in action. Those rays are indeed essentially luminous and the conveyers of light; but the very material differences established by Mr. Wallerius between light and heat make it doubtful whether heat is the necessary concomitant of light proceeding from those rays. In particular, the propagation of light and heat so diametrically opposite most assuredly

assuredly favours the idea of their being distinct elements. All the phenomena of heat may in all cases be as easily, and in many cases more easily, (b) explained, by supposing the solar rays not the real conductors but the exciters of heat; and consequently it may be doubted whether light and heat are essentially united.

All terrestrial bodies have more or less active matter, usually called fixed fire, united in their texture. It is perhaps to the purest particles of this element, essentially the source of colours, that every substance owes its colouring. But the greatest part of this active matter is found in them in an already composed state, forming calorific, inflammable, or phlogistic matters. When pure, I take this active matter to be the element of light, whose great repository in its original state in our system is in the sun, but which in a combined state is scattered throughout all nature. When fixed and imprisoned in inert substances, it produces no heat; but when put in motion by the strong attraction or by the contact of its external correspondent matter, it communicates more or less motion to the inert matter to which it is united, and thence produces fermentation and heat. Calorific and inflammable matters contain a much greater abundance of active matter, much more easily disengaged and put in motion; and, when these are strongly acted upon, they produce extreme heat, and eventually fire and flame, till they are exhausted. This will, I think, account for all the processes of heat, and for the part the solar rays have in exciting it. I will not however,

however, with Messrs. Wallerius and de Luc, assert that there is no degree of heat in the sun's rays. They are active, and therefore in the collision of their particles may produce some heat; but from their extreme tenuity I take that heat to be very small. Hence I am apt to conjecture, that by far the greatest part of the heat produced by those rays is to be attributed to the attraction and repulsion between matter essentially active emitted from the sun its great source, and that portion of the same matter originally or adventitiously incorporated with terrestrial inert matter, which is thereby put in motion and fermentation. The heat thence resulting will be more or less considerable, on one hand, in proportion to the more or less direct, divergent, or concentrated incidence of the solar rays, and the purity of their emanations—and on the other hand in proportion to the quantity of that same active fluid contained in the atmospheric particles, or in the bodies acted upon by those rays. Visible terrestrial fire I take to be occasioned by this active matter, more or less firmly united to and imprisoned within inert matter, producing an explosion by the strong attraction of its external correspondent matter. When produced, it carries off with it all inflammable, oily, humid, and aerial parts containing an abundance of active matter, and leaves behind it, in ashes or residuum, such earthy particles only as contain very little, and are not susceptible of expansion and sublimation. I must observe that the diamond, which seems not to contain much inflammable matter, but apparently a great abundance of the element of light, neither flames
nor

nor appears in a state of ignition or incandescence in the furnace, but is at length entirely dissipated in the fire by sublimation, without leaving any visible dross behind it. The ruby has yet proved in-attackable by fire. Fire has no other effect on it, but that of somewhat sullyng its lustre. Its red rays or colouring principles are too strongly fixed to be dispersed by its force.

Whatever may be decided on the question, Whether the solar rays are or are not the immediate causes of heat, the great Sir Isaac Newton has shewn to demonstration that they are not only the cause of colours, but are separately of distinct colours. Light excited by fire and flame has the same quality in that respect apparently, because the element of light in that case shews itself in its original pure state. Light seems to be the pure active element, the source of all motion and life. Earth, air, moisture, and heat, are not sufficient to bring plants to perfection. Light is necessary to invigorate them, and to bestow on them their proper colours. Experience shows that the sickly flower nursed in obscurity will want its varied hues. Light must either impart the colouring principles, or it must prepare and elaborate its texture to receive or reflect such of its rays as will produce to the eye the genuine and vivid colours of its species.

From all that I have said, you will, Sir, perhaps rather perceive the difficulty of the subject than be able to form any decided opinion on it. Philosophy has not yet attained any satisfactory explanation, and to its future investigations I must leave it.

NOTES AND ILLUSTRATIONS

TO

LETTER V.

(a) Page 436.

WITH respect to this experiment of Messieurs de Saussure and Pictet, I perfectly agree with Dr. Hutton, in a dissertation just published, that it could not be heat which was thus irradiated, reflected, and concentrated. We know from constant experience, that heat is circularly and progressively expansive in all directions, tending to put itself in equilibrium in whatever space it gradually fills, and to place all bodies which it meets in its progress in equilibrium with respect to that quality. Light, on the contrary, we know from every other experiment to move in a direct line till repelled and diverged by some intervening object, from which it again moves in some other direct line, and is thus capable of being concentrated in a focus. Are we from this solitary experiment to conclude that heat in this instance has deviated from its general mode of propagation, and taken up the direct contrary one of light?—Is it not more reasonable to suppose, with Dr. Hutton, that it was not obscure heat which was here reflected and concentrated, but the element of light still existing in its active state on the surface of the cannon ball no longer incandescent, but so weakened as not to affect our vision with the sensation of light? As he observes, light affects not every eye alike : to the person coming out of broad day-light,

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objects

objects in a darkened room are invisible, which to others who have been long in obscurity, and to the same person after staying some time in it, are perfectly discernible. Light is, in my opinion, the sole essentially active matter, as I shall hereafter observe, effluent and reflux from and to the great body of the sun. Absorbed and imprisoned in terrestrial matter, it becomes a constituent part of all other substances, to which it imparts the colouring principle, but is probably without gravity. Its laws, as well as those of elective attraction and repulsion and of gravity in all terrestrial matter, cannot be resolved but in the will of the Creator. Dr. Hutton judiciously observes, that the different coloured rays into which light is divided are wisely endowed with different powers with respect to exciting vision or heat. The combination of all is the most forcible on vision, but has the least power to excite heat, whilst the properties of the separate rays are inverse as to these two purposes. Its power of exciting heat I take to proceed from its attraction of congenial particles absorbed by terrestrial substances, which by their revived activity give motion to such elastic bodies as are compounded of a considerable proportion of its own principle. By the primary laws of nature which we can discover, but which we cannot further investigate, the pure element of light invariably moves in a direct line with inconceivable rapidity; but elastic bodies, though containing the greatest quantity of its principles, obey a different law, whence the propagation of heat is circular and progressive. It is with great pleasure that I find my general ideas on light so consonant to, and supported by, those of this author, whose late publication will, I hope, further excite the attention of all philosophers to this important subject.

(b) Page 447.

The human conception never appears so finite, the proud lord of this little earth never seems so truly to shrink into an atom, as when he raises his thoughts to the immensity of creation. From the microscopic insect to those innumerable luminaries rolling in that space to which we can assign no limits, all is wonder and astonishment. The essence of even the minutest

particle is beyond the utmost sagacity and penetration of man. Struck with so much of the admirable structure both of the whole and of each part as he is permitted to see into, he must confess that more remains behind above his feeble comprehension, and his final exclamation must be :

These are thy glorious works, Parent of Good !
 Almighty, thine this universal frame,
 Thus wondrous fair !—Thyself how wondrous then !

Those innumerable stars which our weak sight can discern, those which the curious astronomer has been able to discover by the help of telescopes, and those, perhaps in still greater number, which even Mr. Herschel's instruments have not been able to draw within our ken, are all so many suns, many of as great, and possibly many of much greater, magnitude than ours. Reasonable and just analogy pronounces that each of these is probably accompanied by as many attendant planets as our sun. In our system the size of this our globe is not even a medium with that of other planets. Whilst the diameter of the Earth is about 6700 miles, that of Mercury is indeed only 2748, but that of Jupiter is 120,650 miles. Can it be supposed that bodies of such magnitude, and stars not inferior to our sun, were created merely to regulate our seasons, to guide our steps or our navigation, or to ornament the canopy of man's residence as with so many lamps ? Much less bodies placed at smaller distances would have equally answered these ends. No ; such immense bodies, and so many suns, many of which are imperceptible to the naked eye, must have had more immediate and more important purposes. Reason must assure us that the planets of our system, and those attendant on other suns, must have been destined for the habitation of other creatures, of whose natures we are indeed and must remain for ever ignorant, but whose existence seems not problematical. The satellites of some of our planets, so wisely increased and distributed to supply light at their great distances from the sun, proclaim it beyond a doubt. If heat, however, is entirely dependant on proximity to the sun and on the intensity of its rays, we can have no conception that any living creature can exist in Mercury, from the violent heat occasioned by the vicinity

vicinity of that body to the sun ; or in Saturn, from the extreme cold arising from its prodigious distance from that supposed source of heat. But if heat is really more dependant on the nature of the materials of which animal or inanimate bodies are compounded, and the aptitude of their compositions to be acted upon by the sun's rays, than on any real warmth conveyed by them, we can then conceive that the inhabitants of Mercury may not be more scorched by their proximity to the sun, or those of Saturn more frozen by their distance from it, than we are on this earth. The density of all the planets exactly proportional to their distances from the sun shews that this is really the case. If the rays of the sun are only mediate causes of heat, if they are only agents capable of bringing it forth, the difference of their intensity at the several distances of the planets may be fully compensated by the more immediate causes, the quantity of calorific particles contained in those planets and the force of their adhesion. The universal and all-foreseeing providence of the Supreme Being extends itself with equal bounty to all and every part of the universe. Under his powerful hand, one single agent operates all the wonders of his beneficent intentions ; and at such unequal distances the same sun animates the soil and inhabitants of Saturn without scorching those of Mercury. Light also is weakened by distance. The composition of the moon is such as to reflect to us a most benign light during the night, but it is probably invisible in Saturn. The composition of that planet's moons and ring must be exceedingly different ; for they not only reflect ample light on that planet, but, notwithstanding their immense distance, are visible, and make it more visible to us.

THOUGHTS

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER VI.

*Abstract of the System of Professor Wallerius on the Formation and
Structure of the Earth.*

BEFORE I venture to expose to you, Sir, my own ideas on the original formation and structure of this globe, and on the changes which have reduced it to its present state, you will give me leave to introduce you to the knowledge of the opinions of Mr. Wallerius, who not many years since published a regular system on those subjects. That learned professor has been styled by the Swedes the father of mineralogy, as they had before given to his countryman Linnæus the honourable name of father of botany, fully confirmed by the universal suffrage of all Europe. This philosopher displays

displays not perhaps that vivacity of imagination nor that seducing eloquence which distinguish Messieurs de Buffon and Bailly ; he will not captivate so many readers, nor obtain such rapid conquest of opinions ; but profound, clear, and concise reasoning will, when his work shall be better known to the learned of Europe, secure to him a more solid reputation of real science. Suppose him not, however, destitute of imagination ; his, it is true, is not exhaled in the flowers of style ; but that chapter of his work in which he calls into order the confused abyss of fluid matter, and in which he combines, arranges, and develops the successive origin of the various substances of which the earth is now composed, will shew him to have possessed that vast conception and that quickness of seizing the most distant connection of things which truly characterize the great genius. Mr. de Luc of Geneva, already mentioned, published about the same time his sentiments on the same subjects, and, though probably uncommunicated, their opinions coincide on most points. As of a more concise and regular system, I shall chiefly confine myself to an abstract of the work of Mr. Wallerius. You will be surprised, Sir, to find him closely following step by step, and in fact confining himself to the explication of that mosaical narration which the philosophers of your nation have accustomed you to look upon as a confused tale, inexplicable by nature, and unworthy of the attention of the man of science ; or at least as the disguised and veiled account of the creation, meant not to convey physical truths, but calculated to suit the prejudices and understandings of an illiterate and

and ignorant people. Here you will see the successive progress of creation delineated, however briefly, by Moses, not only connected with but supported and confirmed by the successive application of the only well known fundamental laws of nature. In fact, if that narrative is true, and, as christians suppose, inspired by the Divinity himself, nothing in it, though certainly not intended directly to instruct us in the arcana of nature, should be found incompatible with her positive and immutable laws. When the sun is said to stand still in Gibeon, or to retrograde on the dial of Ezechias, scripture talks only of appearances as these really were, effected not by any alteration in the rotation of the whole earth, but by some partial refraction of its rays, as yet happens in some mornings or evenings before that body really appears in sight, or after it has in fact disappeared. It talks the language then alone comprehensible, as we yet do, though we know the contrary, in common conversation : but here it relates facts without attending to their being perfectly comprehended or not ; its only object is to instruct us that God was the sole creator and disposer of all that is. This idea of the necessary truth of facts asserted in Genesis will both account for the anxiety of Mr. Wallerius and myself to shew that no part of these facts is really inexplicable by true philosophy, though for want of more certain knowledge our explications may yet be defective.

You have seen, Sir, that I have already endeavoured to shew, from the most authentic documents of the history and gradual pro-

gress of mankind, that the time elapsed since a general deluge, the tradition of which has been from time immemorial preserved by all nations, cannot be of much longer duration than what may coincide with some of the various chronologies of scripture; and that probably the first existence of mankind is not of much older date than what these will warrant. I have also, I think, demonstrated that the arguments adduced by Mr. de Buffon and others to prove a very high and almost indefinite antiquity to the globe itself are both inconclusive and fallacious; and I have shewn against those who reclaim the unerring testimonies of nature herself against history and the narration of the first of historians, that these pretended testimonies are in so much more doubtful as their adducers disagree amongst themselves; and that the jarring systems hitherto substituted to the mosaical account, so far from according better with the laws of nature, or being a clearer explication of her past and present state, are generally founded on absurd or ideal hypotheses, and often in direct opposition with the most certain principles hitherto deduced from her. By the following exposition of the opinions of Messieurs Wallerius and De Luc, you will perceive that in what I may hereafter offer as an explication of Genesis and of nature I am not singular, but supported by the sentiments of some men of high reputation and of profound learning, amongst whom I may also reckon my countryman Mr. Whitehurst. To Mr. Wallerius I with pleasure own that I owe not only a confirmation of my before pre-conceived sentiments, but a much clearer arrangement of them, and a more regular connec-

tion with, and application of, the fundamental laws of nature. A short abstract of his system will, therefore, be a proper and leading introduction to the more detailed opinions which I shall hereafter presume to offer to your consideration.

* “In principio creavit Deus cœlum et terram;” that is to say, the original matter or substance of all things—the pure elements of celestial or luminous matter, and the pure elements of terrestrial matter and of all solid bodies. The first consists of particles infinitely subtle, light, and qualified for motion and activity; the second, of particles fixed and motionless of themselves, very hard and incapable of flaming or shining.

“Terra autem erat inanis et vacua, et tenebræ erant super faciem abyssi.” According to the Septuagint version, the earth was as yet simple and unprepared. These matters were yet inert, without life or motion, and the mass of this abyss by their confused union was as yet dark; but soon the spirit of God, which neither means wind nor air not yet existing, acted upon them, and communicated to these two primordial principles attraction and re-action, causes of all motion, of cohesion and of all combinations. This immediate action of the spirit or power of God, efficient and creative force of all things, by these new properties impressed on these

* The following quotations made by Mr. Wallerius are not taken from the Vulgate, but from some Latin translation used in Sweden.

elements, occasioned the earthy principle to combine with the luminous principle, and gave birth to calorific and to inflammable matter, which, giving necessarily an intrinsic motion to the whole mass, put it into a state of fluidity, or, according to Moses, changed it into water; for it is only after the action of the spirit of God that he calls it by that name. The celestial matter or the matter of light, the active principle, was necessary to impress motion, to produce calorific matter, heat and the inflammable principle; and it was by the means of these last that the terrestrial particles became fluid. The active principle or the principle of light, as well as the passive or terrestrial principle, existed then before these combinations; but light was produced when God said, "Fiat lux," and separated the light from darkness. According to St. Paul, "Deus jussit lucem de tenebris lucere:" whence it follows that the matter of light was already present in the darkness, though it only began to shine when God impressed on it a new activity necessary to produce that effect. "Divisit Deus lucem à tenebris:"—he made a local separation of them by withdrawing from the great mass of the abyss the superabundant matter of light no longer necessary for the first combinations. By the action of this most powerful and active matter of light, thus separated and disengaged from the great mass, God gave to the watery terrestrial matter a motion of rotation on its axis; and hence the distinction of night and day, the first of which must, as Moses says, have necessarily preceded. This rotation and the new motions which it caused in the watery mass gave room for an infinity of
other

other combinations of nature. Thus attraction and re-action productive of a beginning of intrinsic motion, the heat thence resulting, effects of the spirit of God, and the accelerated motion impressed when he said "Fiat lux," co-operated with this motion of rotation to combine terrestrial bodies under the water. No central gravitation which could counteract or retard these combinations as yet existed. Centripetal and centrifugal forces were a consequence of rotation, and contributed to them.

The second day God made the firmament and divided the waters; that is to say, he said, Let there be an extent in the midst of the waters. He extended space, or the firmament, or the heaven, as it is yet called; he drew all the opaque planets, all as yet in a fluid state, from out of the great watery mass, and fixed each of them in its place. They are, or seem above with respect to us, and are consequently justly called waters above the firmament, in opposition to those on this earth which are under our feet. St. Peter agrees with Moses in saying: "*Latet illos hoc volentes, quod coeli fuerint olim et terra ex aquis et per aquas subsistens Dei verbo.*" The rotation already impressed on the whole of the great mass or abyss became accelerated in each planet formed from it in proportion to its axis.

The third day God separated the waters of our earth from its solid matters already combined by coagulation and concretion under the waters. This was effected by the force of gravitation to the centre now first impressed. The like no doubt took place in all the
other

other planets. The flux and reflux contributed not to it, because the sun existed not as yet. The motion occasioned by the precipitation of all matters towards the centre caused an increase of heat, which volatilized part of the waters, and produced air necessary for the vegetation of plants whose seeds were produced this same day. It is in this article of the consolidation of the globe and the first formation of mountainous chains that Mr. Wallerius displays all his genius. It is too full of matter to bear an analysis, and must be followed in the original.

The fourth day God from the great luminous mass, which he had separated on the first day from the liquid terrestrial mass, drew forth the sun and the stars and placed them in their order. It was then that universal gravitation towards these bodies took place, and the consequent revolutions of their planets round them. The moon and other planets became luminaries to us, and, whilst each served its particular end, they all became useful signs to us. Universal gravitation set the whole universe in motion. It is to the placing the sun and stars that Moses attributes the annual motion of the planets, as it in fact depends on it. Having thus described the arrangement of the whole universe, Moses occupies himself solely with what relates to man, the only living being in which we are essentially interested.

Hitherto we may consider Mr. Wallerius merely as the interpreter
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of the mosaical account of the creation. His explication is surely not less easy and simple than ingenious. But, Moses apart, should we examine what he has here advanced purely as a system of cosmogony, it will, I think, appear truly philosophical. It clashes not with any of the well known laws of nature. In the process of first formation, the operation of those laws is indeed admitted only successively as the work goes forward and their aid becomes necessary. The union of all is requisite to preserve the regularity and equilibrium of the whole machine when completed; but they might have counteracted each other whilst forming. The artist who should set his clock in motion whilst the wheels were yet rough and incomplete could only produce an useless work. In this system the Supreme Being begins by the creation of the first simple elements of all things, consisting of only two distinct principles. Attraction and re-action communicated create the first motion, give birth to heat, and produce the first combinations between these primordial elements. The excess of the element of light no longer required for these combinations is withdrawn from the common mass; disengaged, it acquires a new activity, which bestowed on it the faculty of shining. Thus collected, it acts upon the terrestrial mass, and communicates to it a motion of rotation on its axis, from which are deduced the centripetal and centrifugal forces. These new motions are sources of new combinations in that body. This great terrestrial mass is now divided into several portions to form the numerous planets dispersed and placed in space. Each of these acquires an accelerated motion of rotation on
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its axis in proportion to its size or density, which increases combinations within it. All the variety of substances of which the earth and planets are composed are now prepared under the waters, and God communicates to each the motion of gravitation to a centre. The solids, which hitherto were confusedly agitated without having any particular attraction to the centre, are precipitated towards it in ratio of their distances and specific gravities; part of the waters run off into the interstices left unfilled by these shapeless falling solids; the dry land appears, and the remaining waters find their bed on the uneven surface. This new agitation increases heat; which volatilizes another part of the waters, and produces the atmosphere necessary for the vegetation of plants, which are to clothe the land, and whose seeds are now formed. Having thus prepared the opaque planets, God determines to give them a more efficacious life and permanent motion; and from the great mass of light he draws our sun and the stars, which he places each in the centre of its system. From that moment universal gravitation and repulsion take place; the whole universe is in motion; and innumerable globes, whether opaque or luminous, roll in beautiful and durably-connected order in the immensity of space. All nature becomes animated, and the future habitation of man is prepared to receive him. All surely is simple in this system. Absolute creation is only for the simple elements of all that exists. The great acknowledged moving forces of nature impressed successively, each as its activity is required, combine and animate all things, and finally establish for ever that beautiful

beautiful order we admire. Whether as an interpretation of Moses, or simply as a philosophical system, it surely demands the attention of the learned. It is more easily comprehended, and is, in my mind, greatly superior to the complicated devices of Mr. de Buffon, or to any other system of formation which has as yet been broached. We shall soon see many other objections and difficulties which have been reproached to Moses cleared up with equal sagacity.

Mr. Wallerius represents to himself the aspect of the antediluvian world as very different from that which it now wears. The proportion of land to that of sea was much greater. Great part of the waters were hid under the great caverns which sustained the antediluvian earth. Mr. de Luc supposes that of these there were generally three different stages, one above the other. The land, disposed with greater symmetry, though diversified, was not lifted into high and inaccessible mountains; the seas, less deep, occupied not such immense spaces, but, divided into small mediterranean seas, separated and varied the habitations of men without rendering their communications very distant, difficult, or dangerous. There reigned neither stormy winds, nor clouds, nor rains; because the inequalities of the earth were much less considerable, and all its hills susceptible of cultivation, and that the dews and rivers sufficed to water the earth; and, as it is said in Genesis, the Lord God caused it not to rain upon the earth, but provided that the dews which rose from it should suffice to humect its whole surface. The first rains men-

tioned by Moses are those of the deluge itself, and the first winds those that God caused to blow to make the waters retire. In very limited seas there was neither sensible flux nor reflux. The poles of the earth were perpendicular to the equator, nights and days were every where equal, and every climate of the earth was temperate. To operate the destruction of that earth and of man, God changed the centre of gravity a little nearer to the southern pole; the axis of the earth became inclined, and, in consequence of this motion, all was overturned; the seas overwhelmed the lands; the sources of the abyss or of the interior waters were opened by the rupture of its caverns, and those waters spouting from the bowels of the fractured globe covered its surface; the valleys were sunk, and the mountains were elevated; as the psalmist says: *Aquæ supra montes eminent, sed increpatione tua fugiunt, et tonitru tuo abeunt; montes assurgunt, & valles se deprimunt in locum sibi destinatum: limites ipsis posuisti quos transgredi illis non datum est ut terram ulterius contegant.* By this great change the atmosphere was disturbed and climates altered. Impetuous and variable winds, clouds, and rains, obscured the face of heaven and desolated the earth. By such vicissitudes the vigour of plants and of all living creatures was weakened, and the age of man was shortened:—, circumstances which Moses relates concurrently with the traditions of all ages. If before the deluge there were neither rains nor clouds, the rainbow must have appeared for the first time to Noah on leaving the ark. The retreat of the waters, very rapid in its commencement, during 225 days whilst Noah yet remained in the ark was sufficiently
great

great to lay dry the mountainous parts of interior Asia, where Noah and his children descended. A more considerable space was not yet necessary for them. Mr. de Luc thinks that the most inferior caverns did not totally give way at first to deepen the bed of the present sea, but successively, and possibly during some years; and the caverns yet existing in the bowels of the earth received gradually, perhaps during some ages, the excess of waters not comprised in our present seas. In proportion as these ruptures and sinking of the land took place, the waters ran off into them, and the general level of the waters on the earth became much lower than before the deluge. The atmosphere necessarily followed them, and the mountains in consequence became much more elevated into the airy regions than before; thence their temperature was changed, became cold, sterile, and covered with snows. The branch of olive furnished to the pigeon from mount Ararat, where the cold now permits none to grow, has been objected to Moses. But if the waters were yet retiring but not sunk to their present level, which they only gained successively and after the lapse of many years, because it was unnecessary to uncover the whole surface of the earth for the subsistence of eight persons, and the very limited number of animals preserved with them, the atmosphere would only sink gradually with them, and the summits of mount Ararat would still enjoy for some time a warm climate. Mr. Wallerius asserts, that the great eminences were yet only islands, and remarks that the first great plain mentioned is the plain of Senaar, where men arrived not, according

to the most probable computation, until 400 years after the deluge. By the falls of earth and accumulated depositions during the retreat of the waters, the outlets of many valleys would be stopped up, where many great interior lakes must have been formed; many of whose waters have since run off either by undermining or bursting those opposing mounds by their increasing weight, or by their accidental ruptures caused by volcanos or earthquakes, more frequent in the then state of the earth. It was during the long continued retreat of the waters, and the various accidents thence ensuing, that many islands were torn from the continent, and that secondary mountains were formed in succession of time and during several ages after the deluge.

But the great reciprocal changes of lands into seas, and of seas into lands, were primarily effected by the inclination of the axis of the globe. From hence the accumulation of sea shells in the midst or on the summits of our mountains, or deep buried in the bowels of the earth, is to be accounted for. The change of climates operated by this same inclination of the axis, explains various species of those belonging to hot countries now found in our northern climates. Kinds entirely foreign, found on the very shores of seas in which none such now exist, prove, according to Mr. de Luc, that the pretended slow successive change of lands and seas by the perpetual motion of the sea from east to west is totally unfounded. The last deposits of such slow retreat could only be of fish still

existing in the bordering sea, and shells entirely foreign to the climate could only be found at considerable distances from the actual coasts. The slow and gradual retreat here supposed could never form any other than gently-inclined plains; whereas the sea shores in one part exhibit steep rocks and mountains, and in another present even plains almost on a level with its waters. Holland shews that the level of the sea has been the same for a great number of years and ages past, and that the land only gains slowly by the deposits of rivers. According to him also, the small quantity of vegetable earth proves that the globe cannot be of very ancient date. The bones of elephants found in the north belong to the antediluvian world, all whose climates were temperate. Mr. de Luc justly observes, that their being yet found in a state of preservation is an evident proof that the date of their deposition is neither infinitely removed, nor so distant as to be reconcileable with those times when Siberia could have been a hot climate, reduced to its present state of extreme cold by the progressive and slow gradual cooling of the earth from the diminution of central heat (*d*). In the idea of the former antediluvian state of the earth, and the great changes caused in it by the inclination of its axis at the deluge, the learned Mr. Whitehurst perfectly agrees with the two above-named gentlemen. You will find my ideas, which I shall further develop to you in my next letter, so perfectly coinciding with those of Mr. Wallerius, that you will justly think them little better than a repetition. Immediately on our return from Switzerland, and before I had

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had had the advantage of perusing the work of Mr. Wallerius, I briefly had the pleasure of stating to you the heads of my opinion. These are confirmed and greatly improved by the new lights which I have derived from him. If the principle on which we both found our systems be true, it must be one and the same; and its development can only be varied by such additional proofs and details as may occur in its further investigation. Without any further preface, I shall therefore in my subsequent letters lay before you the whole suite of my ideas on the same subjects.

NOTE

NOTE AND ILLUSTRATION

TO

LETTER VI.

(a) Page 469.

MR. PALLAS, who had formerly espoused the opinion of Mr. de Buffon, that Siberia was once the abode of elephants, is now convinced by his later observations that such, whose remains are there found in considerable numbers, must have either fled to those high grounds to avoid an increasing deluge, or that their carcases had been wafted thither by its waters. In his observations on the formation of mountains this author says, that the relics of those large animals inhabitants of Indostan, the elephant, rhinoceros, and monstrous buffaloes, are to be found in great quantities near the course of rivers, and chiefly wherever there is any considerable opening in the chain of the Oural mountains, which bound Siberia to the south. They are deposited at no great depth under beds of sand or slime, accompanied with various sea-shells, bones of fish, and wood covered with ochre: an evident proof of their having been transported thither by water. A rhinoceros, still covered with its skin entire, found in the frozen soil of the borders of the Viloûi, is a convincing proof, says he, that it must have been the most rapid inundation which could have hurried this carcase to those frozen countries before corruption had time to destroy its tenderest parts. He adds that, according to the report of hunters, elephants and
other

other monstrous animals are found as yet covered with their skins at the foot of the mountains which occupy the space between the rivers Indighirka and Kolyma. We may here with Mr. de Luc observe, that the perfect state of preservation in which are found the bones of such animals, so far south as the Oural mountains, is also a proof that the inundation which carried them thither cannot be of older date than that which may be reasonably ascribed to the mosaical deluge. Dr. Hutton remarks, that if the shells accompanying these relics are petrified, as he has since heard they are, it is a proof that they simply proceed from the decomposition of solid strata, in which they had been enclosed, formed under the sea and travelled in the running waters of the earth. But he will not thus subvert this strong evidence of a deluge, till he can bring naturalists to believe with him that no petrification can take place but under the sea.

THOUGHTS

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER VII.

*Further Attempt to explain the Mosaical Account of the first Formation
of the Universe by the successive Application of the Fundamental
Laws of Nature.*

BUT it is my own ideas on this philosophical part of our researches that you require, Sir, and hitherto I have entertained you with the opinions of others. The writings of authors of so much superior authority and of such merited reputation, which I have laid before you, should perhaps condemn me to silence; but I have promised you my own particular thoughts on the subject, and I will now endeavour to collect in order to submit them to your judgment. When I first took pen in hand in obedience to your request, the

works of Messieurs Wallerius and de Luc had not yet fallen into my hands. I have now given a previous abstract of their systems, and particularly of the first gentleman's, both that you may be inclined to give some little more credit to my ideas as supported in great measure by the sentiments of philosophers of such weight, and because their writings have greatly assisted me in developing my own thoughts. Neither will I conceal from you that, wherever I have found their explications consonant to, or ameliorating, my plan, I have adopted them without scruple. With the same frankness I shall endeavour to refute their opinions wherever they happen not to coincide with mine. In a career where it behoves to tread with caution and diffidence, always ready to listen with candour, and to adopt truth wherever I may find it, my motto will still be, "Nullius in verba magistri."

Little satisfied with the several systems I had read before our journey into Switzerland, I naturally turned my thoughts to a more serious consideration of an antient author, often noticed by these, though viewed in various lights and with various sentiments. To him I reverted with so much the greater earnestness, as I already perceived his history of mankind immediately preceding and subsequent to a deluge wonderfully confirmed by the testimonies of all antient traditions in all parts of the world. All of these agree with him, that ten generations of men, of a longevity no longer known to us, preceded a general deluge, in which, excepting a very small number who alone re-peopled the earth, all that former

race of men perished in punishment of their depravity. All the most antient inhabitants of the present earth profess to derive their origin and pedigree from some one of those men, whom he has noted as the fathers of nations, and of almost every one of them some vestige is somewhere or other to be found on record. As a further proof that some such general and not very remote catastrophe had happened to mankind, all history concurs in shewing, not fifteen centuries before the christian æra, as yet feeble colonies emigrating to, and gradually peopling countries the most fertile, and in the process of a very few ages the most populous and the most renowned. These facts, if true, disconcert indeed not a little the ground-work of most modern systems. But this singular combination of traditions derived from the highest antiquity giving, if not proof, at least a greater degree of authority to these points than can be assumed by mere negatives grounded purely on their incompatibility with hypothetical systems, it seemed equitable to examine without prejudice, whether nature herself was really, as these philosophers pretend, in direct opposition with these or other articles of his narration, or whether all of them might not be explained without the violation of her known laws.

Many modern philosophers, whose systems might be shaken amongst christians by the authority of Moses, content themselves with answering to the objections which may be made to them from thence, that the Jewish legislator, though versed himself in all the Egyptian sciences,

sciences, yet, writing for an ignorant people, was necessitated, in order to make himself understood, to deviate from exact physical truths. Mr. Ferber, in a late publication, says with truth, that it was no part of the purpose of Moses to instruct us in that science, and that, content with indicating the effects and successive operations of the creation, he attempts not to expound the causes nor the physical means which gave birth to them. But if his exposition of effects and of successive operations is founded in truth, or even sanctioned by an authority in itself respectable, it will not be, as he pretends, useless to meditate it. This very succession of operations and effects at the first creation or formation of all things may indicate the true secrets of that nature we seek to unveil.

Without philosophical discussion or scientific pretensions, Moses is the plain and simple historiographer, either of those real effects which took place at that epocha, or at least of the most antient traditions transmitted on that subject from the earliest known antiquity. The order of creation which he describes, and the most essential circumstances that accompany it, are confirmed by all the most antient cosmogonies, Roman, Greek, Phœnician, Phrygian, Egyptian, and Chinese: precious remains, not of philosophical systems, but of original traditions. Like him, their authors assume not the tone of learned dissertators, but of simple narrators of facts transmitted to them by still more antient records or traditions. Whatever the Jewish writer tells us of the deluge comes equally confirmed by a
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like concurrence of antique testimonies. It will not surely appear extraordinary if many circumstances in these different relations are considerably altered, and variously accommodated to national prejudices or theological opinions; but, without noticing the Arabs and Tartars, who, though separated by immense regions, adopt almost without deviation the Jewish account, it is surely no less singular than striking, that all the essential points and ground-works should be every where the same, notwithstanding the differences of ages, countries, and religions. The superior merit of candour, simplicity, and perspicuity, above all others, must be allowed to the mosaical narration. Shall such concurring testimonies be rejected without examination? No:—absolute incompatibility with known and assured physical truths can alone outweigh authority so corroborated. It becomes the province as well as duty of philosophers, to give this most antient account the most impartial discussion in a physical as well as in an historical light. Having already considered it in the last, let us now see in what manner such parts of it as relate to natural philosophy should be discussed.

Hitherto most authors who have written upon the subject seem to have first framed their own system, and then to have endeavoured to strain the text of Moses in its support, or to explain it away when that could not be effected. Others have rejected him with flight, because he stood in the way of their own particular ideas: few or none have examined him candidly without retrospect to some pre-adopted system. The sole object of that venerable author

was

was indeed to instruct mankind, who had already mistaken, or were prone to mistake, the creature for the creator, that God alone was the author of all that existed, and had modelled at will, and at no very distant period, those great objects to which they were inclined to attribute powers which belong only to him. For this purpose he gives an account of the creation of all visible matter, and of the formation of the earth, sun, and celestial bodies, and of the order in which they were severally produced. But he informs us not of the more immediate means by which these several arrangements were accomplished. These are mere objects, though great ones, of curiosity, and as such are left to the disquisition of man. The simple facts are given, either as truths immediately revealed by the divinity, or handed down by authentic tradition. He tells us that it pleased the Almighty, after creating the rude elements of this material world, to arrange and call them forth into order successively and at distinct periods. Beginning from the first existence of formless and inert matter, and following it through several stages to the completion of the present regular and most beautiful order of things, he has enumerated the distinct commands of the creator at several periods, and has ascribed to each distinct general effects produced in a succession pointedly marked and defined. How far, and what natural means or physical laws of nature were employed to execute these several commands, will be the province of philosophy to investigate.

All

All philosophers agree that there are certain primary laws which actuate all nature. Few in number, they are looked upon as primary, because seemingly arbitrary, and underived from other natural causes. If this be, as I believe it is, the definition of primary, they must be conceived the first great agents of the divinity, and each of them dependent on his will alone. Whatever is not independent of all other causes ought to be rejected from this list. The philosopher must duly examine what these laws are, and what their distinct properties. Let him then figure to himself a confused congeries of passive matter (the first as yet unconnected elements of organized bodies) without motion or impulsion of any kind. To this he will in idea apply these forces. Motion, abstractedly considered, must have been the first means of organization. He will examine whether it belongs to all matter indistinctly, or to one or more species of matter. Whether impressed on the whole or part, motion is apparently regulated, not by one, but by several distinct laws. To it alone in fact all primary laws apply. Are all these laws of motion necessarily co-existent, or can they be conceived at any period to have acted separately? It is by their action and re-action, and by their mutually balancing each other, that they maintain the present order of things; they all appear necessary for the perfect completion and preservation of the whole work: but were they all in fact requisite for its first organization and arrangement? He will consider whether, for the formation of the first elements into various and distinct substances, or for the aggregation of those substances

stances into larger bodies, the whole combination of these opposite forces should have acted upon them simultaneously *ab initio*, or whether some of them might not have been impressed separately and progressively as the process of formation might require their aid. To elucidate the questions here offered to consideration, it may not be improper to observe that processes, somewhat analogous, are daily repeated in our cabinets. In the chemist's laboratory various substances, possessing different qualities or forces, are mixed to cause fermentation or dissolution; and, when these have subsided or had their effect, others are added to precipitate or fix. In the first great laboratory of nature, might not the forces themselves have been infused or impressed at different periods to execute similar operations and changes? Having, without retrospect to scriptural account, settled these points in his own mind, the philosopher will then proceed to compare the results with the several parts of the narration of Moses. He will find that the first elements of all material substances are there represented in one confused mass, called the abyss, without motion or animation; and that the present order of things was gradually and at distinct periods drawn from it. In the commencement of each of these periods, distinct commands are given by the creator, and distinct effects are produced before its close. May he not consider these commands as distinct laws impressed on nature, by whose operation these effects were generated and completed within the appointed time? In that idea he will apply to each command some one or more of those well known laws,

laws, and compare the effects which such might have produced with the effects said to be produced by that command: and in like manner progressively, until by their successive application and reunion all material bodies are brought into that arrangement and order we now see existing. These primary laws I think may be reduced to general and elective attraction—repulsion and reaction—gravity specific or general—centripetal and centrifugal forces, nearly but not entirely balancing each other, so as to form spheroids instead of perfect globes, and to describe ellipses instead of circles—gravitation central and universal. If the progressive formation which Moses describes could be produced by the successive application of these known means in some one order which may be imagined and devised, the greatest possible weight will certainly be given to his account of the creation; and the real secret of nature, as far as human understanding can dive, will be nearly discovered. Whatever is beyond, that is, the cause of these fundamental laws, must be resolved into the will of the Creator. The greatest difficulty will be to ascertain the order and application of these laws. It may probably require the united study and sagacity of the greatest philosophers to bring the whole to perfect agreement. It will not be surprising if the first enquirers commit important mistakes in this research. Precision in such high matters appertains not to one man. It will be sufficient praise if, by indicating such method, he creates a general perception that by repeated efforts the truth may at last be ascertained.

This patient review of the gradual progress of creation indicated by Moses, compared with the effects which might be in like circumstances the result of the known means and forces existing in nature, I apprehend to be the only method of bringing this great question to a fair and philosophical trial. However unequal to the task, I have ventured to examine the Mosaical account on this plan, rather with a view to point it out to more able enquiry, than hoping to bring it to real perfection. In this difficult enterprise I am far from pretending to have always guessed aright; that would require an extent of sagacity and knowledge far above my strength. I may have erred and often erred, but I am apt to think I have at least hit upon the road which may lead to truth. To ascertain it, I most ardently wish that some more enlightened person, master of the higher sciences, of chemistry and the whole circle of natural history founded on experiment, would take the trouble to pursue the same clue. It would, I firmly believe, lead to a general system less imperfect than the ideal reveries by which philosophy has hitherto been more embarrassed than enlightened. In this arduous undertaking I depend much, Sir, on your indulgence. An approach, however distant, would still be no inconsiderable point gained.

In the moment predestined by his wisdom, the supreme, sole, self-existent Being created by his all-efficient will the first principles of all things in the heavens and on the earth. To the assem-

blage of these as yet inert elements, Moses, if not the inspired writer, at least the most antient recorder of any tradition on the creation, gives the name of abyfs: prophane authors have called it chaos. All seem to mean the same thing, the chemical laboratory of universal nature, the general deposite of the embryos of all existing material substances. Of all these we can only examine such as constitute this earth and what immediately surrounds it. We can only make conjectures from analogy on the materials of other planets. They may be infinitely various and peculiar to each. The composition of the sun too, whose influence is so great on this our earth, is unknown to us. All we know is, that it either transmits light to us, or occasions it to shine by acting upon it. The matter of light, called celestial because the sun and the superior regions seem to be its source, and terrestrial matter, so called because it is the foundation of our earth and of all opaque planets, are the two principles of all things. Whether the element of light, and of fire, and heat, is distinct or identical, is yet and may long remain undetermined by philosophers. I am apt to believe light to be the pure principle of fire, and of the electric matter of which these are modifications. The two primitive matters, the only as yet distinct substances, were confusedly mixed in the abyfs. Both were yet inert and without activity. But soon the power of the Creator acting anew upon the abyfs gave motion to the infinitely subtle elements of light. From that moment, this fluid, penetrating the terrestrial elements inert of themselves, and uniting itself to them in various degrees,

communicated to them some portion of its motion: or, to speak more properly, by mixing variously with lifeless matter modified its own motion. From thence a general fermentation prevailed in the abyfs, which by attrition produced heat. The whole was put into a state of dissolution or liquefaction; and it is under this aspect that the sacred author immediately after gives the name of waters to the abyfs. But the active matter enveloped and incumbered in passive or inert matter could not yet exercise that full liberty of motion which soon after gave it the faculty of shining: in consequence, all was as yet darkness.

It was during this period, to which the sacred writer assigns no definite duration, that the two first principles united to form, by their intimate connection in infinitely various proportions, new substances which may not improperly be called secondaries. Amongst these may be ranged water, oils, sulphurs, salts, acids, alkalis, and all the variety of airs. The various combinations of these secondary principles form perhaps the minutest particles of earthly matter which we are able to discover or appreciate. From these sprang a great variety of grosser substances. It was the effect produced by the two first laws imposed on matter, relative or elective attraction (*a*) and repulsion. From the instant motion was impressed on the elements of light, this fluid, intimately mixed with the elements of earth, constitutes part of all bodies. This impregnation of inert matter by active matter in diverse proportions gave to the first composed substances

substances various reciprocal tendencies towards each other, as far as certain points or degrees where repulsion commences. These laws produced a still greater variety of combinations. I conjecture that it is by the thus limited affinity which active matter diffused upon and in the earth preserves with its purer superior correspondent, that motion is kept alive on our planet; by this our earth is warmed and vivified, and terrestrial nature displays to our eyes all that variety of colours which so magnificently adorn it. These two primary laws of attraction and repulsion, or of action and reaction, are known to us by their effects. But it is impossible for us to assign any other cause of their operations, or of their reciprocal limits, than the will of the Creator. All we can say of them is, that they are means adopted by the first great architect, which to us appear primary. Their visible end is not only the first organization, but the re-production of all nature, and the preservation of the whole work by their equilibrium.

As soon as terrestrial matter was sufficiently impregnated and saturated with celestial matter, God withdrew from the abyss, and locally separated, the superabundance of this last. The element of light, disengaged and depurated, acquired the full exercise of all that activity with which it had been endowed. It shone in all its native splendour. Hitherto night or darkness had overshadowed all creation; but in the instant of this local separation the universe was enlightened, and the first day (not of our sun, which existed not as yet, but) of universal light pierced through space.

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The retreat of the great body of ethereal vivid matter slackened the interior fermentation of the abyfs from which it had escaped. But acting upon it exteriorly with its whole collective force, it impressed on it a new motion of rotation on its axis; and, in consequence of this rotation, communicated to all substances contained in it the centripetal and centrifugal forces. These new motions, no doubt, gave rise to further combinations of substances. But yet a greater degree of interior tranquillity prevailing in the abyfs, since the extraction of the great body of light, gave room to the substances already composed to crystallize, to coagulate and cement together in larger masses, accordingly as they were determined by their affinity or proximity; whilst other particles more minute or more homogeneous were yet suspended in the waters. Another effect of the rotation on the axis was to give to the abyfs (as since to all planets composed from thence) the figure of a spheroid flattened towards its poles. From thence also the succession of night and day on all its parts.

The primitive substances having been prepared in the abyfs by the successive application of these laws, the powerful hand of the Divinity divided the great terrestrial mass into several planets of various dimensions, composed of substances probably differing in many points from each other: a difference arising, no doubt, from the various proportions of the two first principles. Perhaps this division of the abyfs was more immediately produced by the explosion
occasioned

occasioned in it by the sudden escape of the great body of light. However that may be, the planets were projected into the extent of space prepared at the same time to receive them, each in its destined order. The forces of projection, proportioned to the respective densities of these bodies, regulated the velocity of their several rotations on their axis. As I suspect too, that the fluid of light has also an action in this motion, the great mass of it re-united in one body must have given to these lesser bodies a rotation far more accelerated than it could impress on the enormous volume of the abyss of which they were only parts. The acceleration of this motion was probably a new source of combination and aggregation of the several substances contained in the yet liquid mass of our earth, now become a distinct body, and of all the opaque planets.

The time was now at hand for consolidating these planets, and our earth in particular, which from this moment becomes either as to itself or its relations the sole and peculiar object of Moses. As the same arrangements probably took place in all other opaque planets, we too shall confine ourselves to it. He whose will is law impressed on all the terrestrial substances of which it was composed the force of gravitation towards its centre. From that instant those substances, already crystallized or coagulated in all proportions and in all forms, which hitherto floated confusedly in its liquid circumference, were precipitated towards the centre with a velocity proportional to their specific gravities and in double ratio of the square

square of their respective distances. These bodies, tending with unequal forces towards the same point, must have frequently broken and deranged each other. In the precipitate and fortuitous fall of such various masses, of different shapes and unequal sizes, great vacuities must have often been left between them. Water and air flowed into and filled up those cavities. These are the subterraneous caverns filled with waters, which Moses on another occasion calls the abysses of the earth. All authors, with him, suppose such in the interior of our globe; and the little knowledge we have of it confirms it. I suspect these cavities to have been much more capacious and more multiplied at the first formation than they are at present. The revolution which has since happened in our planet greatly diminished their number and size, and caused the waters to burst out from them again to cover the earth anew. But to return: Matter crystalized and coagulated in great masses constitutes the granite rocks, and all the varieties which may be classed in that genus. By their weight they must have been the first precipitated towards the centre, and must have generally formed the great basis of the earth. Particles, however, of the same nature, pulverized in the shock and attrition of the larger masses, longer suspended in the waters by their tenuity, sometimes served as gluten to large bodies, and at other times commenced new aggregations. Such as were the longest suspended are the origin of sands and clays, diffeminated on the surface of the earth. Other substances, more homogeneous, of a lighter and finer texture, concrete in layers of smaller volume, were

were next precipitated to form on the exterior parts of the globe calcareous strata or mountains, which may be termed, equally with the former, of primitive formation. These are indifferently horizontal, inclined, or perpendicular to the surface. Other particles of the same kind, by their tenuity almost in equilibrium with the waters, were yet sustained in them, to be deposited more gradually in beds either horizontal or inclined according to the basis on which they rested. These either filled up vacuities, or accumulated upon the first foundations already settled. All such formations as can with real propriety be called secondary, belong to the deluge or to its consequences. The new acquired solidity of the globe would naturally accelerate its rotation on its axis.

As the earth grew consolidated towards the centre, those waters which could not insinuate themselves into the interior crevices, expelled by the fall of solid bodies, were forced upwards to the surface. They continued to deposit matters of divers kinds with which they were yet charged. Sands, clays, calcareous substances, gave rise to new accumulations, homogeneous or heterogeneous, according to circumstances or the accidental abundance of these substances in this or that point. Towards the surface of the globe, large masses, which had not been able to force a free passage lower, formed fortuitous excrescences and considerable inequalities. The tendency of the globe itself to swell out towards the equator in con-

sequence of its rotation carried many of them more particularly towards those parts, and the highest hills would be found there after the first formation. Other multiplied accidents gave rise to them on every part of the circumference. Between these salient parts, level or inclined plains and sometimes deep hollows were formed; these last became the beds of the seas. I am inclined to think that these seas were more multiplied, though of far less extent, on the primitive earth than they are at present. The deluge, I am persuaded, operated the most important changes in this respect. The remaining waters which could not find place in the subterraneous caverns, of course precipitated themselves into these receptacles, and left the more elevated parts dry. The separation of earth and waters took place on the exterior surface of the earth; the dry land appeared, and the seas found their beds. God then created the seeds of all the plants which cover and embellish the earth or grow in the waters, and which were to be the aliment and food of living creatures; and he confided each to the soil most congenial to its future growth.

But to expand these seeds, to give new life to all nature, a more powerful agent was yet necessary. Whether by the sole act of his will, or by the subordinate action of laws already impressed on matter, God separated and divided into several portions the great mass of light, destined to compose innumerable suns, which might henceforward more directly animate and vivify a still greater number

ber of planets already formed in the extent of space. At his voice these new globes, full of the most active matter, came and occupied each the centre of the system assigned to it. All the wheels of the great machine were now mounted and put in motion, and at that moment universal reciprocal gravitation as it now prevails was established amongst all those great bodies. Till deranged or altered by the same superior power, it will ever animate and preserve the order once established. The completion of the divers systems by the assignation of peculiar centres accelerated probably the rotation of each planet on its own axis, further consolidated its materials, and determined all to describe concentrical orbits round their particular sun and centre. There is probably a general centre; but to what system it belongs appertains not to us to know. A part of the air, fire, and water, and of many other volatile substances, were now rarefied to form the atmosphere of each planet by the action of its ruling sun.

To confine ourselves to our own planet:—The Creator next caused the waters to produce every kind of fish that swims, and every kind of bird that flies in the air; and the earth to produce every kind of animal and reptile that walks or crawls on its surface; and communicated to them a more perfect animation. Our planet waited only for him whom he created the sixth day to be its sovereign. The abode which he had prepared for him, furnished and adorned with

magnificence, and already peopled by an infinity of inferior living beings, was ready to receive the first man and the numerous progeny he was to procreate from the woman whom he soon after gave him to be the crown and completion of all his other gifts.

I have already enumerated the primary laws of nature, to the succession of which I have in this account attributed the gradual formation and completion of the universe. They may all perhaps be reduced to motion—attraction and repulsion—gravitation to a centre. The first impulsion of motion must have been given by the hand of the Creator. He endowed with essential activity that portion of matter which is alone capable of perpetuating it. To all these forces distinct and peculiar laws belong, which must finally be resolved into the will of the Almighty; but to me it should seem that he has made them all dependent on the various combinations of active with inert matter. Two circumstances occur which seem to demand a further discussion, and perhaps to be accounted for by some one of the above-mentioned primary laws, viz. the forces by which first the terrestrial mass, and afterwards the great body of light, were divided and separated into distinct spheres, and these at the same time projected to various distances in space.

As many persons may think that God, even in this moment of the plenary exertion of his power, employed, wherever possible, the
agency

agency of laws already established, and that, in the attempt to explain nature, recourse to the direct action of the Deity is only to be had when other means seem inadequate to the effect, I shall venture to hazard a few conjectures on the possibly more immediate causes of the division of the terrestrial abyss, and of the subsequent division into several parts of the great body of light, which, according to Moses, happened at distinct periods of the creation. It should seem, indeed, that the first extraction of light from darkness, or the local separation of the great body of light from the terrestrial mass, must be attributed to the sole will of the Creator. But the division of the latter into several portions, and their projection into space, may perhaps be looked upon as its consequence, and accounted for by laws which yet seem to obtain in nature, and were then no doubt already impressed. The division of terrestrial matter into various planets was perhaps effected by the explosion which the sudden escape of the great body of light occasioned in the abyss. This explosion may be assimilated to, and accounted for in the same manner as, the explosion which takes place in the Leyden bottle when the electric matter disengages itself from it, or may be compared to the explosion caused by the fiery fluid escaping from gunpowder as soon as it is in contact with exterior fire. This great explosion of the abyss dispersed to various distances its several particles, from whence the several planets were formed by the attraction, within certain distances, of smaller to larger particles of matter. But this force of projection was instantly moderated by the gradually
over-

overcoming attraction of the immense body of light; and the planets, as soon as formed, were arrested at several distances in their progress, and forced to turn round this great centre. So much in explanation of the division of the great terrestrial mass. Let us now turn to the possibly more immediate cause of the division of the great body of light, which did not take place till the fourth day.

On the third day of the creation, the various substances of which the planets are composed received the law of gravitation towards their respective centres. The specific density in proportion to the diameters of these planets was necessarily much increased by their consolidation. The action and re-action between them and the luminous body became stronger: from their increased density the planets felt nearer to this last; and thence the near pressure of this multitude of denser bodies became at last preponderant, and caused the globe of light to burst and fly off in all directions. The great affinity of its parts soon rallied the scattered elements in various points, and formed them into so many suns. Projected with prodigious force into space, each of these globes drew after it in its course such planets as lay in its way: soon, however, the united attraction of these very bodies which it had carried off in its suite producing its full effect on it retarded and finally stopped the force of its projection. Limited and repelled also by the sphere of activity of other similar bodies forming at the same time in its neighbourhood, this sun became fixed, preserving only of its first
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impulsion

impulsion internal motion and rotation on its axis. In other respects each sun became stationary and centre of its particular system. It is from thence that from that moment, by its attraction and repulsion, or by the constant flux and reflux of that vivid matter of which it is the source and centre, each of these suns regulates the courses and revolutions of the planets subjected to its rule; from thence each maintains the equilibrium and balance with all the other luminous bodies and their divers systems which surround it in the whole extent of space. Such or some such explanation may perhaps, without constant recurrence to new exertions of the Divine power, account for the division and projection of the terrestrial abyse and of the great body of light, by the application of laws which seem to have been established immediately before the distinct epochs assigned to these events by Moses.

I have now, Sir, laid before you the explication which I think may be given of the Mosaic narrative, and the ideas which I have framed to myself from thence of the work of the creation. It appears to me, that the process I have here described may be fairly deduced from the plain meaning of that text maturely weighed; and, as far as I have any knowledge of nature, that it is in no part incompatible with her known and certain laws. (In particular points I may be mistaken; but I am persuaded a proper successive application of those laws to the effects described by the sacred author would both be a full explanation of him, and the surest clue to the discovery

discovery of the most important truths. Yet I am still aware that, however probable any explication of this chapter of Genesis given or to be given may be, it will by some be peremptorily rejected upon the old plea that, its language being adapted to the intelligence, or, in other words, to the vulgar prejudices of an ignorant people, we are not there to look for that exactness and precision required in philosophical discussions where that science was never meant to be inculcated. But I will venture to assert that the veracity of its author cannot be screened under the subterfuge of condescension to vulgar errors. He announces facts as positive truths: these are not alterable in compliance with language or opinions: if they are true, they may as yet be unresolved, but cannot be irresolvable by the real laws of nature. Let us, by examining more minutely the text, see how far the accusation of adopting without scruple erroneous modes of expression is founded in truth. It will be at the same time a further illustration of the foregoing doctrine, and of its conformity to the Mosaical account. Where truth or the honour of God is not concerned, the false notions of nature which might have been entertained by the Jews are not indeed therein meant to be scientifically combated: but does Moses in any part of it expressly confirm the mistaken ideas of ignorance? Is he not on the contrary often in direct opposition with vulgar prejudices? These two points will best be resolved by following the plain and literal words of Genesis according to the most usual English translation.

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“In the beginning God created the heaven and the earth.” Both are hereafter to be brought into form and order, and therefore these words must mean the rude elements of both. With respect to the terrestrial part they certainly do so mean; for immediately after follows:

“And the earth was without form, and void.” Ovid, not improperly perhaps, expresses it—“*rudis indigestaque moles.*” The Latin word “*vacua*” in the Vulgate, and the English word “void,” would perhaps, as some interpreters and translations express it, be better translated by “inert.” “And darkness was upon the face of the deep.” The Vulgate, I think, more properly calls it “abyss.” The elements of light were either yet uncreated, or had not received the faculty of shining. “And the spirit of God moved upon the face of the waters.” Other interpreters translate it “the breath of God stirred up or agitated the waters.” The spirit or breath of God (*b*), metaphorically taken for his power, is here adopted with peculiar propriety to express the first impression of motion, which the whole sentence seems to imply. “Waters” is here made use of for the first time, no doubt to shew that the abyss then became liquid.

“And God said, Let there be light: and there was light.” The light was now either first created, or more probably, since the elements both of the earth and of the heavens were already in existence, first received the faculty of shining. Inflammable matter, composed of a

large proportion of its elements, then only kindles into visible fire and flame when, more disengaged from grosser particles, it has acquired a new acceleration of motion. Light was now first enabled to exert that full and free activity with which it was already endowed by the breath of God, when depurated at this command from lifeless matter by local separation, which we find effected at the same instant.

“And God divided (c) the light from the darkness. And God called the light day, and the darkness he called night: and the evening and the morning were the first day.” The real and local separation of those elements that have the faculty of shining from those that are of themselves dark is here pointedly expressed; and by that very separation it may be fairly implied that light then shone out for the first time. Here it must be observed that the text is in opposition with common ideas. The matter of light, though not yet formed into suns or stars, is separated from dark matter. A night and a day are established, whilst, according to the same author, the sun was not yet made, or at least did not shine upon the earth. According to vulgar and even philosophical opinions, the sun is either the source or cause of light to the earth. It either did not then exist or did not shine upon it, and yet a night and day are boldly asserted. Some philosophers, unwilling to suppose that the great and glorious body of the sun should not have a more early date than this spot of earth (an opinion, if the sun was at any time
created,

created, unfounded on any valid reason theological or philosophical), have indeed asserted that the sun already existed, though obscured by a thick atmosphere. Such an obscure light could not have been said to be good, that is to say, perfect in its kind, which is certainly the meaning of "good" throughout this chapter. But if, as both the present literal words and the sequel imply, not the sun and stars in particular, but the great mass of light from whence they were afterwards made, was then locally separated from the waters, and by its influence caused the latter to turn upon its axis, then a night and day (though not ours, which we shall find hereafter to make a second establishment) are easily conceived to have perfectly taken place on the surface of the liquid abyss.

"And God said, Let there be a firmament in the midst of the waters : and let it divide the waters from the waters. And God made the firmament ; and divided the waters which were under the firmament from the waters which were above the firmament ; and it was so. And God called the firmament heaven : and the evening and the morning were the second day." The whole of this is unintelligible to vulgar understandings, and seems to have no less puzzled the learned. Let us first premise that the Latin word "firmamentum" in the Vulgate, which the English version has copied, a translation founded perhaps on the prejudices of the times, is not to be imputed to Moses as favouring them. That word certainly conveys to the vulgar the idea of a solid mass : but the Hebrew word made use of

literally means expanse or extension ; and surely this is as philosophical a definition as can be given of the heavens, or of that immense space we see above us in which the heavenly bodies are placed. By "waters," as we have already seen, is meant the whole liquid mass of the terrestrial abyss ; and it is of its separation that it is here questioned, and not of the separation of the seas from dry land, which is a subsequent operation reserved for the third day. The literal explanation will then be, that God then divided the great fluid mass, and placed several parts of it in local separation above the fluid globe of this earth in the expanse which he prepared for them. In other words, he then from the great fluid mass formed and locally separated from each other the earth and all the other planets composed of it, all of which continued as yet in a fluid state, and are therefore called "waters."

"And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear : and it was so." This is a distinct operation, and the work of the third day, and thence evidently shews it to have been of a quite different nature from the work of the preceding day. A similar operation no doubt took place on all the other opaque planets ; but Moses confines himself entirely to this globe, as its distribution is the only one interesting to man.

"And God said, Let there be lights in the firmament of the heaven,

to divide the day from the night. And let them be for signs, and for seasons, and for days, and for years. And let them be for lights in the firmament of the heaven, to give light upon the earth : and it was so. And God made two great lights (*a*); the greater light to rule the day, and the lesser light to rule the night. He made the stars also. And God set them in the firmament of the heaven to give light upon the earth ; and to rule over the day and over the night, and to divide the light from the darkness : and God saw that it was good."

Let us observe that God is here said not only to have then first formed, but to have then first placed these bodies, amongst which the stars are included, in the heavens. This is indeed contrary to the opinion of many philosophers, but is easily explained if we suppose the great body of light to have been then first divided into several bodies. Let us also take notice that here is a second division of night and day, and here for the first time the sun and moon are said to regulate them ; that is to say, our present nights and days, which are thereby literally discriminated from the first days and nights, which belonged not to our earth and our sun, but to the abyss and the first created body of light, as soon as locally separated towards the end of the first period of creation. Though the author only mentions the utility of these bodies to the earth as luminaries and signs, he does not exclude other purposes for which they may be designed. These are the secrets of the Most High, which
man.

man may reason upon but cannot penetrate. In like manner, though the sun and moon are distinguished as the two great luminaries, (N. B. it is not said "bodies") yet he enters not into the discussion whether either of them is larger or less than the stars, which appear so much less, and whose formation is simply mentioned as happening at the same time. As luminaries to the earth, the sun is said to be the largest, and the moon the next, though less; and in that light they certainly are so. The real comparative magnitude of these bodies and the stars, and the discrimination of the sun, being a luminous body, from the moon, an opaque reflecting body, he was not ordered to inform us of. These too are objects left to the disquisition of man. It is but lately that the sun was found to be the stationary body round which the earth and planets depending upon it move; yet, without offence to science, even philosophers talk familiarly of the rising and setting of the sun. But in all this chapter, where nothing but exact truths were to be delivered, Moses says not a word that may either favour the old or new opinion. In the poetical parts of scripture, the apparent motion of the sun is often alluded to: it is yet, and ever will be, the language of poetry and of common conversation; but here nothing is said of it. The sun is simply mentioned to divide light from darkness, and to regulate the day on earth. To declare his formation to be the work, and his functions to be the appointment of God, to shew his particular utility to man, was the office of the sacred legislator. Beyond that, his charge extended not.

Upon the whole it will appear, that though Moses, confining himself barely to simple facts, discusses no philosophical questions, yet, where truth and these require it, he hesitates not to run counter to received prejudices, or to more learned opinions. On the other hand, not a single word can be said to be in contradiction to any certain rule or fact in nature, however they may be at variance with particular hypothetical systems.

Having now, I hope satisfactorily, shewn the impropriety of rejecting every attempt to explain the Mosaic account, under the general pretence of its not affording a fair and sufficient groundwork for philosophical enquiry, I shall next advert to general or particular objections which may be made against the explication I have adopted.

As I have given it, not as a certainty, but as my opinion founded upon the words of Moses, that the beginning he speaks of was the real era of the first existence of this visible material world, I must observe that it is pretended by many, that it would be absurd and even impious to suppose that the power and goodness of God were never exerted before the appearance of this world of yesterday.

I must first premise, that it is not in my thoughts to restrict to this very limited date the creation of spiritual beings. The knowledge of their existence must depend on revelation. The same au-
thor

author gives us clearly to understand, that many such beings preceded the creation of man. How many thousands or how many millions of years before, or whether the creation of all these took place at one or at several epochs, we are not told; nor does it belong to us to know. But, however distant, they too, if they were created, must have had a beginning; and that beginning must have had an anteriority in the depth of eternity.

But it is not to such creations that this argument is directed. By it, it should seem to be insinuated that the act of creation, even of material bodies, is fitting, or, what is in this case the same thing, necessary to the Divinity, and to the attributes which belong to it: but if the existence of any other beings whatever is necessary to it, they are then co-existent and co-eternal with it—they are God. If there are spiritual beings, as is generally believed, as well as material ones, of whose existence we are certain, all are necessary to him and a necessary part of his essence. God would be a composition of the one and the other; which is incompatible with the unity of his essence: or he would be matter only. In either case a part of the Deity would be inert and without intelligence. There would be in reality no God: and those works which disclose the most perfect combinations would be without an intelligent architect. By endeavouring to fathom beyond his depth, man may easily confound and inextricably puzzle his limited understanding: but this absurdity will always be manifest to all who do not purposely seek to blind themselves.

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If exterior production is a necessary and essential quality of the Divinity without which it would be less, or less perfect; it is not one, or several acts of production, that could satisfy it. Productions from it would have been incessant from all eternity past, and must be incessant for an eternity to come. Every instant would be productive of new worlds or new beings. The perpetual motion of matter seems the pretence for this argument. Matter, indeed, on this earth is perpetually new-modified; it is constantly changing its forms. It is a law of preservation and reproduction. It has on this earth a constant rotation; but its limits are fixed, beyond which it cannot swerve. The earth itself in its totality, and all the substances it contains, are unalterable: we see neither new worlds nor new beings arise. The same beings, without essential changes, are incessantly reproduced on its surface. Nothing is new under the sun, who himself suffers no change.

If matter is not co-existent and co-eternal with the Deity; if God created it without necessity at the moment which best pleased him; it imports little whether it had its first existence seven thousand or seven millions of years ago. The one and the other are equally points in eternity. If matter might have been created or not created, annihilated, or preserved, with perfect indifference to the power or grandeur of the Deity, it belongs not to us to fix to the Creator the times of thus manifesting his glory. Man, who cannot dissemble to himself the narrow bounds of his own intelligence, should adore

in silence. If God reveals it not, it is utterly impossible to him to assign the moment; but, if there was a suspicion that his goodness had deigned to intimate it, I will dare to say, that even such intimation, though not positive, ought to have more weight than all our ideas of fitness. Why should the earth have been pre-existent under another form? Why should the sun have been made before the earth? Is it a more difficult work to the Almighty to create absolutely, than to fashion and mould anew? Are we not here measuring the powers of the Godhead by those of man? Is the sun, because of greater magnitude and of a nature which appears to us more noble than that we tread under our feet, a more complicated work? Did it require a longer time to be brought to perfection?—I have already demonstrated that the date of the existence of creatures adds or diminishes nothing in the grandeur of the Creator. In vain will it be said that the long duration of existence, and the frequent renewal of the sun, the stars, of the earth and planets, give a more becoming idea of the majesty of God. Whatever he creates will remain perfect as long as it pleases him, and wants no repairs or renovations. I own, in my conception, nothing more magnificent than to imagine all this vast visible universe drawn from nothing, at one and the same time, at his voice: all these globes whose magnitude and whose numbers astonish us, springing forth at once at his command to take their destined places, to compose divers systems ruled by invariable laws which there retain them, and to form by their union and reciprocal connection

connection one great whole, whose perfect harmony reason shews us, but whose limits the most exalted imagination cannot measure.

Again, it is said to be an absurd and grovelling idea to imagine that the majestic body of the sun should not have been formed till the fourth day, or that he should have been placed in the heavens merely to illuminate this little spot. To be just, however, these objectors should join to the earth all the other planets of this system; and I think that luminary can scarcely be presumed not to have been formed for the utility of these and the earth conjointly. Though not sole proprietor, our globe will surely be allowed to have some little claim in the services he renders to all. The moon confessedly belongs more particularly to the earth, as their satellites to Jupiter and Saturn; but even this does not exclude the moon from serving other purposes, or being useful to other creatures besides man. Reason and a just idea of the grandeur of the designs of the sovereign architect may tell us, that it is not probable that those other immense planets, which the sun too illumines and directs, and whose situation or magnitude seems to give them real superiority over this our globe, should have been created merely to serve as lamps to direct the traveller or the husbandman on this spot—purposes which might have been attained with less expence of matter: but the mission of Moses was solely to declare to man, what more nearly concerned him, the benefits which in the comprehensive wisdom of the Creator he adventitiously received from these great bo-

dies, though formed to answer at the same time other and still greater purposes. If what he does say is true, we are not to cavil with him, if beyond the limits of his avowed subject he tells not all that is so. Not all the sciences of Egypt could have taught him the facts he does disclose. Here is no display of science. He is either the plain reciter of the most authentic traditions handed down to him through a small number of long-lived generations which he afterwards enumerates, or he is the messenger of God to instruct his people in those truths only which were necessary to them to guide their religious principles or their conduct through life.

To those who with me give the highest credit to Moses, though they may differ from me in their interpretation of him, I will observe, that although his province was so limited that he may have left truths of curiosity behind, yet his words, in their natural acceptation, seem to fix to that moment the absolute creation and not the renewal of the earth, and that not only the earth was then first created, but the sun, moon, and stars also. After having enumerated the separate works of the six days or periods of creation, the author says: "Thus the heavens and the earth were finished, and all the host of them. And on the seventh day God ended his work which he had made (e): and he rested on the seventh day from all his works which he had made. And God blessed the seventh day, and sanctified it: because that in it he had rested from all his work, which God created and made. These are the generations of

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of the heavens and of the earth, when they were created ; in the day that the Lord made the earth and the heavens." No language can surely express more clearly or explicitly, that within the aforementioned periods the earth and the heavens with all their host, by which we know in the language of the east was meant the sun, moon, planets, and stars, were then first generated and completed.

A very great number of philosophers peremptorily assert, that the whole stratification of this earth, the aggregations of variegated substances, the crystallization and concretion of granitous bodies, and still more the sedimental deposition in beds of calcareous substances, evidently require for their formation a slow succession of ages, instead of that limited time which seems to be allowed in Genesis. Hence they infer that what they call the carcase of this globe, which had been wrecked and dislocated before the time the sacred author fixes for its re-appearance under its present form, had already gone through not one but several revolutions in an infinite succession of ages anterior to its present mode of existence. Others, who think it necessary to adhere strictly to what they deem the letter of scripture, will perhaps be no less offended at the extension I have given to some of those periods of the creation which Moses indistinctly calls days, and which they therefore think are common days of 24 hours. But does Moses really restrict them to these ? Have they an absolute coincidence in duration with our solar days, or only a relative conformity, as equally founded on a revolution of light?

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If the former, they could only be so called by anticipation, as the same author, as I have already observed, positively says that that sun was only formed and placed in the heavens on the fourth day, and takes notice of his then appointed functions to illuminate the earth and to regulate its days. Even if that body had existed before in its present form, it confessedly had not till then shone upon the earth, and therefore could not be the regulator of its days, to which it was then for the first time appointed. To those who seem to demand a succession of many ages for the formation of this earth and of its various substances, I will answer—Who shall measure the days of the Eternal, before whom a thousand years are as one day? Who shall determine time to Him, whose will is equally sufficient to combine the formation of a thousand worlds in the twinkling of an eye as in hundreds of ages? The will of man puts into motion every part of his body, or such part only as he thinks proper: it sets into action, without even his knowledge, a variety of liquors and of complicated springs, a multiplicity of muscles, nerves, and fibres, which he cannot count; or it confines this activity to such only as are necessary to accomplish its present purpose. The will of man arbitrarily directs, without his being himself able to follow the rapidity of his determination, the time he wishes to employ in the execution of these motions; and shall we dare to restrict to such slow succession as may suit our ideas the operations of that will which is itself complete action? The actual forces of nature operate with a rapidity which the eye cannot follow. In chemical experiments

experiments we daily see those forces, which now subsist only for its preservation and reproduction, put in motion by man, compound or decompound the constituent parts of various substances, and again depose them with admirable regularity and precision in the space of a few hours: and shall we suppose that the same forces employed for the first combination, or, in the idea of these philosophers, for the renewal of this world, would require ages for the completion of the work? But let us leave to presumptuous man those little ideas which suit the weakness of his conception. Though he cannot, nor ever will be able to define or comprehend that action which he himself exercises by his will at every instant, let us yield all to the depths of his views, to the justness and precision of that balance which he dares to hold up to weigh the powers of the Almighty.

Concurrently with all ancient cosmogonies, Genesis informs us that it pleased the Creator, for reasons best known to him, to draw forth the universe into its present order, successively and gradually, at distinct periods which Moses calls days. Let us examine whether those days were necessarily coincident in duration with our solar days, or whether, not only without offending but even in strictly following the meaning of the text, the three first of these (for the consolation of those who demand a longer time for the combination of matter) may not with propriety be supposed to have had a much longer duration, though probably not of ages as some of these pretend.

tend. Moses says, that night or darkness covered the abyfs till fuch time as God by his fpecial command drew forth the light to illuminate it, by a feparation of thofe elements to which the property of fhining was given from thofe to which that quality was denied. This clearly feems to be underftood of what he calls the heavens and the earth, or their elements, which, in the preceding fentence, he tells us were already created. The clofe of this day, formed by the firft rotation of the abyfs round its centre, finished the firft period of creation; but to the preceding night or darkness no definite duration is given. Why not refer the combination and aggregation of various fubftances, for whofe confection philofophers are fo much in pain to find time, to this abfolutely and neceffarily undetermined fpace? During this night, as the author tells us, “the breath of God ftirred up the deep;” or, to make ufe of the interpretation of Milton, “the fpirit of God, dove-like, fat brooding on the vaft abyfs and made it pregnant.” If a longer time is wanted for the execution of that fupreme will which can produce without time or effort, years or even ages may be taken in this indefinite fpace for the gradual cryftallization or concretion of the feveral fubftances of which this earth is compofed. It was not, in my idea, until the combination of all terreftrial fubftances was completed by the active co-operation of ethereal matter, that the great body of this laft, no longer neceffary for that purpofe, was drawn from out the abyfs, and, thus difengaged and depurated, acquired that acceleration of motion which caufed it to fhine forth in native fplendor.

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It was this separation which produced this first day, which apparently belongs to the abyss and universal light, and not to our little earth and to its sun, which are only small portions of them; the establishment of our nights and days is actually referred to a distinct and yet distant period. It was on this first separation of light from darkness, that the abyss received a motion of rotation on its axis, which produced the successive variation of night and day on its several parts. As the abyss as yet contained not only the whole substance of this our little earth, but also that of all opaque planets diffused through this and every other system which fill space, the revolution of this enormous globe upon itself, describing a larger circle, must necessarily have taken a proportionably longer time than is required by our earth. To this immense mass of matter, containing the substance of comets as well as planets, we may reasonably at a medium attribute a density at least equal to that of our earth; and therefore the difference of the duration of its rotation round its own axis would be to the time of the diurnal revolution of our earth in proportion to the difference of their respective diameters. We may then not only believe, but analogy will lead us to conclude, that this first day of creation cannot be measured by our solar days, and that it may possibly be divided by years instead of hours.

Reasons no less strong authorize us to believe, that twenty-four hours should not limit the second day, when the opaque planets

were drawn out of the great terrestrial body to take their assigned places, and to receive a rotation proportionable to the force of their projection and their respective masses. Neither should the third day, which equally preceded the placing of the sun and stars in the heavens, be thus limited. These days belong to the universe, to all systems, and not to one only. There is no more reason to restrict them to the duration of the rotation of the earth than to that of any other planet, shorter or longer. Who can ascertain that the velocity of rotation of the planets was then the same as at present? Our sun, and the stars which compose the heavenly host, had not yet received the order to take their stations in the centre of their respective systems, and to fix by their more immediate influence the particular rotation of each of their planets. The influence of gravitation towards a nearer centre would certainly have an effect upon the whole mass, as well as upon the constituent parts of each planet.

The sacred writer fixes the fourth day for the time of the sun's taking his present station in the centre of our system, from whence he first began to regulate the days of his subordinate planets, each differing in duration from the other. This then is the first of our whole system, though various on each of its planets. It is the first that can be appropriated to the earth: the first which on this globe, and on this globe only, is measured by the precise time which it takes to complete its diurnal rotation, and which is divided to us into night and day by the succession of the solar light on all its parts.

STRUCTURE OF THIS GLOBE. 515

The preceding days, analogous but not coincident with ours, belonged to a different order of things. They were properly, however, to be so termed, because they were the real days of the universe and of universal light. Every particular planet has a like succession, which we with propriety call its day: but in none of them is the duration the same as on this earth.

One more objection it will be proper to take notice of. Mr. de Buffon, who pretends that the planets are portions, cooled by slow degrees, of the ignited vitreous fluid of the sun, maintains that all terrestrial matter could never have been dissolved in water, because several substances are not by our chemistry dissoluble in it. This argument may be retorted against him, because there are likewise many which are not fusible by fire. But this same chemistry teaches us, that several substances, which by themselves are refractory in fire or indissoluble in water, yet become easily fusible or dissoluble by the addition of a third substance. Consequently, in the great recipient of universal nature, where every force and every kind of substance were united and mixed, it is easy to imagine that by their combined powers all terrestrial matter may have been reduced into a watery fluid state. Chemistry is certainly much improved and improving, but it never will be able to dive into all the powers of nature. A variety of substances and liquors is by the digestion of man and animals dissolved and transmuted into blood, chyle, bile, and all the several fleshy parts; at proper times, milk is from the

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same also generated in the female sex alone : in infancy part is diverted to the gradual increase of bones to a fixed degree and term, when this part of the operation ceases :—processes these which all the art of man will never be able to imitate. Earth, water, air, sulphurs, salts, are elaborated by light and heat, through the fibres of trees and plants, to produce an infinite variety of barks, woods, leaves, flowers, and fruits, of different textures, hues, tastes, and flavours, each according to the seeds or roots from which they spring. Even from the same roots their products are altered by budding or grafting : stems, leaves, flowers, and fruits, are formed and developed in a few days : all these processes the philosopher daily observes ; but all his sagacity will never be able to descry in what manner from the same apparent principles this variety, constant in each kind, is produced ; and shall he dare to fix times and bounds to the Almighty in the very act of exerting his creative powers ? In spite of his presumption, man shall never add one cubit to his height, nor one hair to his head, nor shall he ever penetrate beyond a certain depth into the secret laws then instituted for the organization, preservation, and reproduction of all nature. In the humble investigation of those wonders which may exalt his ideas of the supreme wisdom, or expand his sentiments of gratitude for the benefits of the creator ; in the pursuit of discoveries useful to his welfare, the labours of man will be rewarded with gradual success ; but whenever he shall attempt to pass the limits prescribed to his province and understanding, doubt, error, and confusion, will ever be the final result of his temerity.

NOTES

NOTES AND ILLUSTRATIONS

TO

LETTER VII.

(a) Page 484.

THIS attraction is called elective by Mr. Whitehurst, in contradistinction to the attraction or gravitation towards a centre. By this elective or relative attraction, substances composed of various constituent parts, but more or less connected by affinities, were coagulated, concreted, or crystallized into masses of different dimensions. It was necessary for the formation of all terrestrial substances; for none, as all have some proportion of the element of light, can be deemed perfectly simple or homogeneous. Had the general attraction to a centre been coeval with it, the various substances would not have had time to coalesce by affinity, but would have all been instantly precipitated to the centre in ratio of their specific gravity and in double ratio of the square of their distances. Neither was this central gravitation proper during the existence of the great terrestrial watery and chaotic mass. It would have been an obstacle to that division into parts which took place in the succeeding period or day, in order to form from it the earth, the planets, and comets, not only of our own but of every other system. To this division of the watery mass, and the distribution of its several portions in the extent of space, I think the expressions of Moses to describe the operations of the second day can alone relate.

late. The consolidation of this earth, and no doubt of all other planets, and the separation of the dry land from the waters on their surface, were the distinct operation of the third day; and this was evidently effected by the impression of central gravitation. But though this central attraction must be excluded from the watery mass, the centrifugal and centripetal forces need not; as these were no obstacles to the formation of substances into various masses within it. They counteracted each other; and, if the former tended to throw off, the latter withheld within certain limits; by which means all matter, whatever might be afterwards its specific or central gravity, was kept floating and in motion within the bounds of the liquid mass. These considerations convince me that the laws of relative attraction, and the centrifugal and centripetal forces, were impressed on the great watery mass of terrestrial matter, but that the law of gravitation to a centre was reserved to the planets when extracted from it. From the to me apparent incompatibility of the law of gravitation to a centre with the regular formation of substances into a variety of aggregate masses, I think it evident, that the fundamental laws of nature and motion were not in the first formation of things all simultaneously impressed, though all are equally necessary for the preservation of nature fully established and completed. As soon as this law of gravitation to a centre was impressed in each planet, all the substances of which it was composed, already formed into various bodies, were according to its rules precipitated towards its centre; by which means that centre became consolidated and compact; whilst the surface of each globe, by the natural confusion of a variety of different masses, of different sizes and figures, pressing towards the centre with very unequal velocities, became irregular and uneven. Hence were formed on it in some parts eminences, and in others hollows and cavities. From the former the waters, which had not penetrated into the crevices caused by the irregular fall of massy substances of every possible shape, ran off to fill up the latter. Thus the dry lands appeared, and the seas found their beds.

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In this place I shall observe, that the element of light, or the celestial matter, is an immutable substance, but capable of being incorporated with, and united to, and by that means becoming a constituent part of, all terrestrial substances. It is alone essentially indued with motion, which it communicates more or less to naturally inert matter; but it may be so imprisoned and fixed as to become motionless, till actuated upon either by the touch or near approach of its corresponding matter, or released by violence from its prison. Thus the latent fire, which yet I take to be not the pure element of light, but a mixture of it in a very large proportion with inert matter, thence called phlogiston, contained in a cold flint, is disimprisoned by the shock of any hard substance, and regains that activity which it derives from the large proportion of elementary light contained in it. Earth, water, and air, though generally looked upon as distinct elements, I conjecture to be transmutable *inter se*. Several late experiments seem to give weight to this supposition. I think too that there is reason to imagine that vitreous matter, by a new combination with fire, air, water, and salts, may be transmuted in the laboratory of nature into calcareous matter; and, *vice versa*, the latter into vitreous. Hence, as we have already observed, stalactites and marbles are formed by exudation through vitreous rocks, and vitreous crystallizations under calcareous rocks. Appearances, however strong, may yet be deceitful; and on these last conjectures the explication of the Mosaical system of first creation is in no wise dependent.

(b) Page 497.

What the Vulgate translates "*spiritus Dei ferebatur super aquas*," and the English version, "the spirit of God moved upon the face of the waters," Dr. Geddes has thought proper to render by "a mighty wind blowing on the surface of the waters." It is possible that instead of "*spiritus Dei*," "the spirit of God," the more literal translation may be "*flatus Dei*," or "the breath of God," the meaning of which must be allowed to be the same. But the rendering the "breath" or, if he pleases, the "wind" of God
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by "a mighty wind," is totally unsupported by any valid reason. The one he alleges is, that "*of God*" frequently occurs in scripture, merely to convey the idea of great and extraordinary. In some instances it may be so, but it is more frequently applied to beings or places which God had particularly adopted, as, "children of God;" "Sion, the mountain of God;" though this hill is far from being remarkable for magnitude. In this place there seems no kind of reason to convert it into "mighty." In the instant when the power of God was particularly exerted, whether wind or any other means were employed by him, their attribution to him seems peculiarly proper. The "breath of God," by the most easy of all metaphors expressing his power and virtue, is moreover particularly consonant to the great scope of the author, whose aim was to inculcate and declare God to be the creator and founder of the world. "A mighty wind" is therefore here totally inapplicable to the ideas of Moses: to those of a Sanconiatho, or of materialists, who attribute all things to chance or to the sole powers of nature, it may be congruous. Scripture is best interpreted by itself, and that with the greatest propriety where the same subject is treated of. In the 33d Psalm it is said, according to the Vulgate translation:—"Verbo Domini coeli firmati sunt, et spiritu oris ejus omnis virtus eorum." Here surely there is no question of a "mighty wind," but of "the breath of the mouth of God" allegorically taken for his power. Here the Latin expression "*spiritu*" is not made use of in its more usual acceptation, or in that of the English word "*spirit*," but certainly denotes the "breath of the mouth of God." The English translation is, "By the word of the Lord were the heavens made, and all the hosts of them by the breath of his mouth." Here there can be no doubt but that it is meant to declare that all the powers and laws of nature are derived from him; and it is certainly the best and surest interpretation of the words of Genesis.

(c) Page 498.

In his prospectus, Doctor Geddes rendered the word here translated by
6 "divided,"

"divided," by "severed" the light from the darkness. In the work itself since published, he has altered it to "distinguished" the light from the darkness. What propriety or use there can be in this alteration, I cannot divine. Light and darkness are necessarily distinguished, if I understand that English word; therefore the Hebrew word must signify something more.

(d) Page 501.

In this place Dr. Geddes had said, in his Prospectus, "For God made two great luminaries; a greater luminary to regulate the day, and a less luminary to regulate the night; and the stars. All these God placed in the expanse of the heavens, to illuminate the earth, to regulate the day and night, and to sever the light from the darkness." In the work itself he has thus rendered this passage: "For God having made the two great luminaries (the greater luminary for the regulation of the day, and the smaller luminary for the regulation of the night), and the stars; he displayed them in the expanse of the heavens to illuminate the earth, to regulate the day and the night, and to distinguish the light from the darkness."

Not being versed in the Hebrew language myself; to those who are learned in it I must refer to decide, whether this new version, so essentially different from his first and from all the translations which have hitherto appeared in any language, is more just and correct; or whether it is merely adopted to support the private opinion that the sun, moon, and stars existed before, and that Moses only meant to say that they were now for the first time made apparent to the earth.

(e) Page 508.

In his Prospectus, Dr. Geddes's translation runs thus: "And on the seventh day he rested from all his creative operations: therefore God hath blessed the seventh day, and made it holy, because on it he rested from all his works which he (then) created into existence." Notwithstanding the interpolated palliative *then*, nothing could more strongly militate
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against the author's declared opinion, in his critical remarks already inserted into that same prospectus, that Moses talks not here of an absolute new creation of the earth, but simply of a renovation or new conformation of its already long existing principles. In this idea, he says, he is confirmed by the opinion of the learned Origen. That Origen, who believed that this earth after its prophesied dissolution by fire would be again renewed, that the saints might reign on it 1000 years under a happier form, should adopt this opinion of the past, is not to be wondered at. I presume the Doctor has scarcely embraced his opinion of what is to come. At all events, to confirm his system of an anterior earth, he has thus corrected his former translation of this passage: "God completed all the work which he had to do: therefore God hath blessed the seventh day, because on it he ceased from all his works which he had ordained to do." Whether the new corrections which I have noticed are really more literal and correct translations of the Hebrew, or whether they are interpretations of it, the learned in that language must decide. If it should prove the latter, it must be owned to be the boldest method of supporting private opinions ever yet pursued. To give a new interpretation in a note or remark to any passage may be allowable; but to give a new construction to the text itself is not so fair. In one of the above-mentioned passages, to say, "God made the sun, moon, and stars, and set or placed them in the heavens," is very different from saying, "God having made the sun, moon, and stars, displayed them in the heavens." From the one it may be doubtful whether those orbs were then first created; from the other the question is positively decided.

THOUGHTS

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER VIII.

State and Aspect of the Antediluvian World, and Changes operated by the Deluge. Cursory Observations on Doctor Hutton's New Theory of the Earth.

LET us not judge of this earth, such as it came out of the hands of the beneficent Creator, by the wreck permitted to escape from his avenging arm. Scripture informs us, and the account stands confirmed by the traditions of all nations, that the longevity of our antediluvian ancestors extended to the to us astonishing term of more than 900 years. Such vigour could only proceed from a more benign temperature of the air, and aliments of a more invigorating nature, less apt to create disease and jarring humours in the human body.

These were every where fruits and vegetables; for it was not till after the deluge that animal flesh was permitted, or perhaps thought of. In the present variable and often cold climates of the earth, where vegetables are frequently scarce and always flaccid, this food is become necessary to preserve strength and vigour. Some great alteration in the position, structure, and temperature of the earth, seems the only rational manner of accounting for the present so marked decay of human nature. Let us then consider what different state of these would constitute a more perfect equilibrium in the air, a more equal temperature, less productive of those sudden vicissitudes which so strongly affect both animal and vegetable powers, and life; let us imagine every circumstance which might contribute to create a more constant and salubrious climate; and we shall probably have divined the cause of this stronger constitution of man in the antediluvian ages.

With Messrs. Wallerius, de Luc, and Whitehurst, it appears to me, that the axis and poles of the earth must have been before the deluge, perpendicular to the equator. It is not only the most natural, but, in case the centre of gravity was placed in the centre of the earth, seems also the necessary position. Astronomers have not been able to discern the smallest inclination in the axis of any other planet; if there is any, it is at least so small as to have escaped their observations. The great inclination of ours is incontestably the source of incessant conflicts in the atmosphere, and of many con-

sequent disorders on the surface of the earth. When the centre of gravity was in the centre of this globe and its axis perpendicular, the attraction of the sun being equal on all its parts would keep its course steady and without deviation in the track of the equator. It would perform the same journey of one degree exactly in the same given time of 24 precise hours, and its whole revolution in 360 days. The moon in like manner equally attracted by the earth would perform its rotation round it in 30 days without fraction. Hence, as we before observed, the most ancient computation of years of 360 days, and of months of 30 days, though totally inapplicable to the present months, or to years either solar or lunar. It is no small presumption of the once existence of such a year, preserved by ignorance of the reality and reverence for antiquity, till such times as the error was perceived to be too gross, and was by degrees more or less accurately rectified by succeeding generations. The few who survived the change, and their immediate progeny, confounded to find their ancient division and duration of the year inadequate; tried, as we find in history, a variety of expedients to conciliate their traditional computation with reality; and the first somewhat successful attempt was the addition of five intercalary days at the expiration of the old year. Precision was certainly become extremely difficult, and has not been ascertained above two centuries. When the centre of gravity was changed, the motions of the earth and of its attendant planet became tremulous and irregular, and no longer kept exactly pace with time. The nuta-
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tion of its axis became at least more considerable, and its rotation round it somewhat variable; the poles were diverged, and in consequence the track of its orbit became equally oblique to the equator. So long as the poles of the earth were perpendicular to the equator, and that its course varied not from that line, the days and nights were equal throughout the year; perpetual spring reigned all over this globe, and its temperature was every where moderate. After the change, God finds it necessary to fore-warn Noah that he must expect successive changes of seasons, and vicissitudes of heat and cold, such as he had never yet experienced.

In the former world, the nature of the surface and the disposition of the lands and waters probably assisted not a little, with the position of the globe, to moderate both heat and cold in every quarter of it. Less prominent inequalities on the face of the land, a more equal proportion of land and water, and a more general intermixture of these, would contribute to this, and were no doubt the means. The constant vicinity of seas of very moderate extent would from the vapours exhaled from them incessantly moisten the dry land without the help of rains; and Moses expressly tells us, none were necessary to water the earth: and hence the rain-bow, first appearing to Noah after the deluge, was literally to him a new phenomenon. In these limited seas the flux and re-flux were scarcely sensible, but sufficient to freshen and sweeten the waters by gentle agitation, and the air by moderate breezes. In the present state of things, vast tracts of deep

deep and extensive ocean, with little or no intervening lands, cover two-thirds of the globe, are exposed to the whole influence of the moon, rise into mountainous waves, and by their mutable and tumultuous agitations raise equal conflicts in the surrounding atmosphere. On the coasts, far-extended capes and promontories create strong and violent currents, and increase by opposition the fury of waves rolling to them from immense distances and stirred up from unfathomable depths. To this the great irregularity of the bottom of many seas, either by the accidents of the deluge, or by these currents scooped out into deep valleys or into abysses creating whirlpools and tornados, contributes not a little. It appears that the uneven bottoms and depth of seas, still more than their immensity, render them boisterous. The vast Pacific Ocean from being shallow is seldom heaved into high waves. Elevated ranges of mountains on the land, whose freezing regions are ever in conflict with the inferior atmosphere, intersecting each other in various angles, and divided by deep valleys acting as so many suckers, raise tempests and hurricanes in the air, which rouse an equal tumult in the adjoining seas; and in their turn the agitations of the waves disturb the air anew. Where mountains rise near or from the coasts themselves, the sea is so much the sooner and more terribly affected. The deep Atlantic Ocean and the Northern Seas between Asia and America, forced also into strong currents by numerous far-projecting lands, are in consequence for ever agitated by dreadful storms and tempests. To preclude such violent and sudden changes, both in the seas and
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in the atmosphere, which by the present disposition of the earth affect the health and vigour of every thing that has life, we must necessarily presume it to have been very different when life could be protracted so much beyond its present span. Instead of immense uninterrupted oceans, and extensive continents without seas diversely traversed with chains of high mountains, the lands, more equally distributed on every part of the globe, were no less beautifully than usefully intersected by seas of moderate depth and extent, communicating with each other by streights which further facilitated the intercourse of their inhabitants (*a*). More frequent and extensive perhaps towards the equator, they would soften and refresh the hotter air of that climate lying directly under the course of the sun, and in parts more distant they were so disposed as to moderate increasing cold. Every where the vapours rising from them would furnish dews, proportionable to the wants of the somewhat varied climes, to irrigate the earth. On the surrounding lands no towering mountains reared their heads into the cold regions of the air to accumulate snows and ice, to chill the atmosphere, or gather round them storms and tempests; but hills of small elevation, perhaps under the equator somewhat higher to moderate the heat, afforded gentle breezes to fan the air, and diversified the habitations of mankind. This disposition of the lands and waters would entertain a mild and benign temperature as well under the sun's course as in parts more removed from its influence, and, conjointly with the constant equality of days, nights, and seasons, would afford perpetual
spring

spring to all parts of the whole surface of the earth. No cold or burning varieties of temperature would freeze or scorch the earth, or alternately chill or boil the blood of living animals, check or dry up the sources of vegetation. It was not till after the deluge that God said to Noah, "that winter and summer, heat and cold, seed-time and harvest, should alternately succeed each other;" proof that it was not so before, and that he then forewarned him of a new order and dispensation of things hitherto unknown to him. If there are yet situations on the earth where fruits and flowers appear together, men pay dearly for this advantage by pestilential heats and deluges of rain, equally trying and destructive to the human frame. Messieurs Wallerius and de Luc allow not more than 50 toises to the highest antediluvian hills, and Mr. Whitehurst reduces them to as many feet. I shall not presume to fix their utmost elevation; but I imagine that, higher under the direct rays of the sun, and lower at greater distances, they no where were of such height as to be the repositories of ice or snow, or to chill to frost either their own or surrounding atmospheres. Perhaps the elevation of some islands under the equator might considerably exceed their highest computations. Such might perhaps be necessary to draw more forcibly the vapours of the sea during the day, thence to be gently wafted by somewhat stronger breezes during the night, to irrigate with more plentiful dews adjacent continents exposed to the full ardours of the sun. But storms and thunder were no where engendered, because the air, whose temperature was almost equal in all parts, was not over-

charged in one place to disburden a superabundance of moisture, electricity, or heat, in destructive torrents on another. By the favour of this so happily tempered equilibrium of the air, the earth throughout all its climes produced with little labour in every season the most salubrious fruits and vegetables, and men arrived to the highest perfection of their organization. Intemperate changes altered not or shook the springs of life; and man, if his own excesses or accidents hastened not his end, sunk gently, at the expiration of many centuries, into the arms of death pronounced against him since his fall. Those animals which at present cannot range beyond the torrid zones wandered with impunity into the middle circles; and if any required a cooler climate, they found one more suitable to their natures under the poles: to the present sharp air of those situations they have since been gradually inured and fitted.

Such a position of the globe and such a distribution of its lands and waters as I have here described, we may, I think, conceive adequate to the maintaining of a never-fading scene of fertility, and of a mild and nearly equal temperature, over the greatest part of the earth; and some such causes must have existed to have given that constant salubrity of climate which protracted the life of man so far beyond its present limits. Some few of the consequences of such a different order of things—an invariability of temperature, subject to no changes from heat to cold, or to the vicissitude of seasons, and the sufficiency of dews to water the whole earth without the
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intervention of clouds or rain—are clearly, through briefly, indicated by Moses. That the present constitution and aspect of this globe are very different is no objection; for God declared in his wrath “that he would destroy the then earth itself, along with its inhabitants.” Consequently we may with the utmost propriety look upon both its climates and the present disposition of its surface as entirely altered from the primitive state: that its outward coat has been broken and dislocated, we shall presently see that the most convincing evidences every where proclaim.

The original happy state of the world and of mankind, the every-where commemorated golden age of antient tradition, was soon to finish. The very distant prospect and flow approaches of death had steeled the heart of man against all fears of succeeding eternity; and the very happiness, ease, and abundance of his situation had by degrees obliterated all remembrance of his creator and munificent benefactor. Though it appears that private murders sometimes happened, it does not seem that rapine and war, where every spot was abundantly fruitful without much toil or labour, were yet to be numbered amongst his crimes; but to irreligion, luxury, and debauchery, he had abandoned himself. Murder may perhaps appear to us the worst of crimes; but the real abnegation of a God, from whence every possible crime may and will flow, as we have unfortunately witnessed in a neighbouring kingdom, may justly be deemed the most heinous in the eyes of the Supreme

Being; and it is in consequence that which has in all ages most visibly drawn down his pointed vengeance, not always indeed upon individuals in this life, but upon whole nations whenever contaminated with it: at length the measure of the crimes of men was full, and God determined to destroy the whole race, one single righteous man and his family excepted. As a future check to the depravity of the heart of man, and as a constant admonition of his dependant and uncertain state, the earth was thenceforth to be condemned to a degree of sterility, from which he should draw his subsistence by hard labour exposed to the inclemency of seasons, and his life was to be shortened from 900 to 90 years. It was not men alone who were to perish in the flood, but the whole earth with them; its whole face was to be so altered as to leave scarce any trace of their former habitation. To work a total change for ever in the constitution of man, the temperature and the whole disposition of his future abode were to be altered. To effect this, no ordinary means could be sufficient. All the water contained in the atmosphere precipitated at once could not have covered the lands to the depth of a few yards, even for a short time, much less for a twelve-month; not only the then seas must have been overturned upon the lands, but the waters concealed in the bowels of the earth must have been called forth to inundate the whole surface above its highest eminences, however less considerable than at present, and to plunge once more the whole globe under one universal sea without shore or limit: and these are in fact the means which Moses describes.

describes (*b*). The mediate cause was the will of the Most High to punish the sins of men; and this cause, as well as the fact, is recorded in all the most antient traditions of mankind. The immediate cause, or the natural means employed by God to effect his purpose, is left to the disquisition and conjectures of philosophy. To disclose it was probably not in the power, nor certainly in the purpose, of the sacred writer. The will of the Almighty who had formed it was alone sufficient to disjoint and break up at once the antient frame of this globe, without the intervention of any secondary agent: but as the employment of intermediate agents as ministers of his will seems most consonant to the usual dispensations of the all-prescient Being, we may be allowed to suppose one, the idea of which seems forcibly to have struck many philosophers. As yet unknown numbers of comets, whose erratic courses and eccentric revolutions astronomy has never been able to fix or calculate, must in their near approaches to the sun pass through the orbit in which the earth moves round that luminary. Should God have directed a comet of the first magnitude to pass at a fixed time very near our planet, the first effect of that great body, frozen in its long aberration and intercepting the rays of the sun, would be to condense and precipitate in hail, snow, or rain, the whole waters of the atmosphere. In its nearer approximation, its attraction, acting with irresistible force on the seas and on the frame of the earth, would heave up to great height the waters of those, and forcibly break open the vaults of the exterior surface of the globe. The outward coat once fractured, the
waters

waters of the abyfs, hitherto confined under it, would with violence fpout out from all its crevices. Hence all the waters below the earth, as well as thofe contained in the former feas and thofe in the atmosphere, would re-unite to cover the dry land. The globe itfelf would probably be drawn from its ufual track ; and, had not the paffage of the comet been inconceivably rapid, its attraction might have entirely diffipated it, or carried off its fragments in its train. The instantaneous effect of the tranfitory near approach of fuch a body would be fufficient to diflocate the exterior frame of this little planet, and by its confequences drown the whole under water. The force of steam and of dilated air we know to be immense ; and the dilatation caufed by thefe great motions, and by the conflict of fire, water, and air in the bowels and great interior caverns of the earth, much more capacious in the former globe than in the prefent, would for a certain time yet uphold the ftructure of its exterior fabric : but as frequent explofions gave paffage to this ftrongly dilated air, and as the conflict of the contending elements began to fubfide, the vaults which had hitherto fupported the exterior frame of the antient globe gave more or lefs way, and left deep yawning chafms. Wherever thefe abyffes opened, vaft portions of the adjoining lands with all their rocks and varied ftrata funk into them on one fide, whilst, violently torn by the fhock from their contiguous parts, they were uplifted into the air on the oppofite fide far above their antient level. Thefe, however, by their flanting fall left fuch fubterraneous caverns as ftill fubfift, into which the waters began to run, to uncover by degrees

the face of the earth. This oblique sliding of great portions of the land into the caverns opened to receive them is the cause of the present formation of our mountains, presenting on one side sloping banks, and on the other high uplifted and rugged precipices (*c*). These mountains are by naturalists termed primitive, though in fact their origin is solely to be dated from the era of this great convulsion. On many parts of the globe, the whole land with all its seas and eminences sunk perpendicularly down into former caverns, whose vaults were entirely crushed, there to form the deep basins of our present extensive seas. The tract between Europe, Africa, and America, gave place to the great Atlantic Ocean. Towards the north, where this sea is narrowest, it seems to have sunk the most unevenly and in many parts the deepest, and to have left in consequence the highest and most rugged shores. The same appears to have happened to the narrowest and most northern part of the tract now forming the sea between north-eastern Asia, and north-western America. Very unequally sunken in those parts, where numerous islands are still left standing, these seas are in consequence very unequally deep, and vast currents and eddies are formed in their uneven bottoms. The immense tract between southern America and Asia seems to have sunk more regularly, and consequently the Pacific Ocean poured into the void is generally shallower, and its basin, less intersected by deep valleys, forms a calmer ocean. Towards the northern pole as far as latitude 70 north, by much the greatest part of the globe's circumference is land still standing on its antient vaults,

vaults, which suffered not the total ruin which entirely broke in those of the southern pole. On the contrary, the whole extent of the antarctic circle is probably sea to the southern pole itself; but that whole sea is very shallow, and is from that circumstance constantly covered with ice (*d*). This difference between the two hemispheres is indeed most strongly marked.

In the whole northern hemisphere, by much the greatest portion of the circumference is land; in the southern a still greater proportion is sea. In this the narrowing continents, and even all their considerable adjoining islands, with the exception of a strip of South America which reaches to latitude 56, finish about the latitude 38 south, to which are extended the southern points of Africa and New Holland. All former lands have sunk to give place to a very shallow sea. From this more perfect consolidation of the earth towards this southern pole, the centre of gravity of the globe became changed, and removed a good deal nearer to it. From that moment the axis of the globe, formerly exactly perpendicular to the equator, became diverged; from thence the rotation of the earth round the sun became tremulous, and its course was altered from the exact track of the equator, and became in like proportion oblique within the precinct of the zodiac. From hence to the new world, which was to rise from the ruins of the former, the vicissitudes of seasons, the irregularities of the year, of months, of nights, and days (*e*). Whether these first great changes in the out-
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ward frame of the globe, the consequences of which were the deluge and an alteration in its course, were caused by the sole fiat of the Creator, or by the intermediate agency of a comet, is and must remain doubtful, and its decision very little material. I have, without attaching much importance to it, offered the intervention of such a body as possible in the concatenation of things, or as most agreeable to the ideas of those who wish to perceive the God of Nature constantly effecting his decrees by means pre-ordained, but not repugnant to the order of nature. What is of much more consequence is, to shew that since the first formation of the earth such changes have at some time or other taken place; and this the attentive consideration of the present structure of this globe will fully demonstrate.

It is evident from the general testimony of the actual state and stratification of the earth, that this globe has suffered a violent change, and that its pristine surface has been broken up, fractured, and dislocated, almost throughout its whole extent; that such convulsions and such general rupture of its outward coat, both by the displacing the waters of former seas, and by forcing out those which we know are yet in great abundance in its bowels, must have occasioned a very universal deluge, is no less evident; that this deluge did once take place is confirmed by all the united testimonies of history and tradition in all ages, and corroborated by the still legible traces of water even on the highest mountains of the earth, to whatever date

we may reasonably refer the epoch of this great convulsion. Well-known causes in the usual course of nature have frequently occasioned partial devastations; but it cannot be supposed that such a general overthrow can have been frequently repeated. To some general revolution must we then attribute whatever marks of ruin appear universal.

From the observations of Mr. de Saussure on the Alps, and of every other naturalist in all mountainous countries, it appears, that innumerable strata, which from the evidence of their internal texture must have been originally formed in horizontal positions, are now found in an upright or more or less inclined position. Not only particular strata, but the whole diversified stratification of entire mountains of the first magnitude, are frequently in this case. In the same regions the hardest rocks, containing exactly similar strata, and exhibiting faces and angles so precisely corresponding that, if they could be again brought together, their fractures would fit so as to again appear one body, have been evidently torn asunder. From these fronting precipices, forming by their chasms the narrowest valleys, the mountains on each side more or less gently slope off to form some other valley of a different aspect. These succeeding valleys are either formed on both sides by the sloping backs of mountains whose upper strata there dip into the ground, or by the sloping back of one mountain and the upright cliffs of another. Such is the uniformly general structure of all mountainous tracts, diversified
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only by partial accidents, easily accounted for in such convulsions. As a further proof that the actual appearances of these mountains have been occasioned by such ruptures and the overthrow of a formerly more level surface, Mr. Whitehurst has shewn, that in mining we find all the strata which have on one side been reared up into the air, dipping on the other into the bowels of the earth, with the same continued inclination and exactly in the same order, to the greatest depths into which man has yet been able to penetrate. If in some cases one or more of the superior strata are wanting under ground, their rubbish confusedly mixed will be found forming to some depth the soil of the valley or plain under which they dip. Thus a multiplicity of fractures in the former surface of the earth, and the sinking of great portions of it in various directions into its original deep and their wide-gaping caverns, have visibly formed those groups of mountains and those deep valleys which intersect them, whose magnitude in some parts of the world strikes us with astonishment. Notwithstanding their at first sight apparent confusion, their separate parts being of moderate extent, the undoubted vestiges of dislocation may be easily traced; and that it has been effected in the above described manner, every concomitant circumstance will in my opinion testify beyond all probability of doubt.

But there are still greater effects of a total subversion of a former globe, which cannot be so easily carried in view. In some parts, whole countries have been uplifted on one side and half buried on the

other in vast gulphs which opened to receive them. One of the most striking instances is that of Norway and the adjoining parts of Sweden. The coasts of Norway are the most abrupt and the highest known on the ocean, elevated to the stupendous height of from 300 to 900 toises above its level. From these the general face of the country slopes till it meets the Baltic, under whose basin part of its former surface lies deep buried. In the shock of the sudden fall of such extensive tracts, vast fissures were opened in its uplifted parts, forming at present the most frequent, the deepest, and the narrowest creeks yet known in any part of the world. The sea, both in these creeks and under the high cliffs of these coasts, is of a depth at least equal to their height. Various ruptures and breaks in this extensive mass of dislocated land, occasioned by the dreadful shock, have at the same time raised innumerable ranges of mountains on the falling face of the country looking to the Baltic. But even these ruins, great as they seem, are small if compared to the total disappearance of those immense tracts which now form the beds of the oceans which separate the two continents, or to that devastation which sunk below the waters more than three-fourths of the whole southern hemisphere. As soon as this last event took place, the interior consolidation of that part of the globe changed its centre of gravity, and with it diverged its poles. From the dreadful movement and shock which the whole globe received from this sudden alteration of its centre of gravity, and consequent change of position in the heavens, prodigious changes must have ensued in the remaining continents. As
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well the former seas with which they had been diversified and intersected, as the yet unsubsided waters of the deluge, must have been poured over, and in irresistible torrents have laid waste, the lands already softened by their long sojournment. The ravages which these must have occasioned in seeking the newly-sunken beds of the present seas are scarcely to be imagined, much less are they capable of minute development. In their impetuous course, mountains must have been overturned, new chasms and valleys excavated, and their spoils hurried to great distances to form new eminences composed of their ruins. Hence claim their origin, the irregular stratification of some mountains nearly obliterating all traces of their first formation, the corresponding angles of valleys visibly scooped out by waters, and the confused aggregation of many isolated eminences to which philosophy has with some propriety affixed the name of secondary (*f*). The first ruptures of the original comparatively level surface of the antediluvian world, when vast portions of it were on one side suddenly sunk into the bowels of the earth and were as suddenly elevated on the other, must have thrown off in torrents the then prevailing waters from these new heights into the no less newly-created hollows. Part of these would filtrate through yet gaping crevices into the remaining subterraneous caverns, forming still existing reservoirs under the earth; and the remainder would either sojourn and fill up such basins as it found inclosed on all sides, or run off still further till it found at various distances the beds of the ocean formed or forming to receive it. Hence it is that the
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most inland mountains carry on their faces the evident marks both of the temporary sojournment of the waters on their highest summits, and of their precipitate retreat. The impetuous course of these waters, from the highest broken pinnacles of the mountain top through its torn flanks and torrent-worn valleys to the level of the plains or of the sea, is yet as clearly to be distinguished as those small furrows which sudden rains occasionally plough up on their sides before our eyes. From this cause, and from the overturning of seas which formerly diversified the most inward parts of the yet existing continents, the vestiges of impetuous torrents are visibly to be traced on almost every part of the surface of the present earth.

Such are the outlines—strongly, I think, marked by universal nature—of the first great effects of that terrible convulsion which obliterated every feature of the pristine world: for God had said that “he would not only destroy the perverse race of men, but with them also the earth they had inhabited.” Its surface was overturned, its centre changed, its position and its course in the heavens altered: with these its fertility and its beneficent temperature were also lost: the life of man was thence shortened in the very first instance to half its former period. Within a twelvemonth the great convulsion had subsided; and the ark, which contained the chosen few destined to be the fathers of a future race, guided by the hand of the Almighty amidst this dreadful wreck, rested on Mount Ararat, from whence the waters were shortly after withdrawn. It

appears that, from the time of its first resting, the progress of their retreat was slow and gradual, taking up a space of 61 days; and it probably continued, after the landing of Noah, no less slow on the general surface of the earth greatly below that high situation. The waters ran off by degrees from the continents as the successive breaking down of subterraneous caverns deepened the destined bed of the ocean. A small portion of the earth was sufficient for the maintenance of the few inhabitants left on it; and, from the long abode of mankind on that mountain and its neighbourhood (for it does not appear that men spread themselves into the plains of Sennaar till after the death of Noah), it is reasonable to suppose that great part of the globe was yet covered with waters. The summit of Ararat, little elevated above their general level at the descent of Noah, yet produced the olive branch, though now by their secession condemned to bear eternal snows. In their first impetuosity the waters had ravaged and ploughed up the surface of the broken earth, and were loaded with immense quantities of soil mixed with broken rocks rolled down with the torrent. These spoils were frequently arrested in their course by narrow passages, and threw up mounds which for a time formed vast lakes and inland seas, some of which still remain, but the greatest part of which, by the breaking down of these accidental mounds from the increasing weight of waters, disappeared in the first centuries succeeding the deluge. Over and above an infinity of interior lakes, many of whose traces may yet be discerned by the curious observer, we may class with these
many

many great formerly-inland seas which are now gulphs of the ocean. Such were those I have already noticed as probable ; in the Atlantic, the Gulph of Mexico ; in the Indian seas, the bays of Bengal, of China, and Corea, where strings of islands, the Antilles and the Moluccas, are the only remnants of barriers which formerly upheld those seas far above the present level of the ocean. At what time these were discharged into it, the records of mankind give no intimation ; and it probably happened within the first four centuries, when the whole race was yet confined within the limits of Armenia, and the newly-uncovered plains of Mesopotamia. The Red Sea, called in early times the Lake of Reeds, probably burst open the Straights of Babelmandel somewhat later. To the breaking down of the mounds which formerly separated the Black Sea from the Mediterranean, and this from the Atlantic, probably at least 1000 years after the deluge, tradition and history give formal and repeated testimonies. I conjecture that even the ocean did not immediately at the deluge sink down to its present level. The rupture of superior caverns may then have prepared its bed and limits ; but the successive weight of waters pouring into it from all parts may have at length, as Mr. de Luc with great probability imagines, crushed down other inferior vaults lying under these, and have finally settled its actual level. My reason for this supposition is, that I perceive the age of man still protracted, during the first four centuries, to nearly 450 years ; but when these last great changes were accomplished in the days of Phaleg, his course is again shortened

shortened to half that term, and continued successively decreasing in the ensuing centuries, till it rested at its present span. Cold is dependent on the elevation of the land above the level of the sea: so long as this kept higher, the most elevated mountains of the globe still enjoyed a more moderate climate: snows and ice could not yet there accumulate, and consequently the vicissitudes of heat and cold were much less sensible on every part of the earth, its climates were milder, and its produce more wholesome and succulent: hence the constitution of man, though greatly impaired since the antediluvian times, still preserved a degree of vigour unknown to us. But as soon as the bed of the ocean was, by the increasing weight of waters poured into it from the discharge of many hitherto inland seas, sunken to its final level, the atmosphere fell with it, and left all the eminences in much colder regions of the air. It was not, perhaps, till after this was completed, that the already displaced poles were diverged to the full extent of 23 degrees, thereby producing a still greater variation of climates and seasons. But no sooner had these last great alterations taken place, than the summits of the highest mountains began to accumulate eternal snows and ice, and chilled the temperature of the whole earth, thenceforward becoming less and less salubriously productive. From that epoch, the vigour and age of men, animals, and plants, successively decreased, till they became fixed at their present feeble and short standard. So long, however, as the mounds of the Baltic and Black seas were upheld, and that their waters consequently covered great extents of northern Europe and Asia, proba-

bly for 1000, possibly for a greater number of years after the deluge, the cold of the north was moderated, and the heat of the south softened by their influence. It was not till after that period that man felt the full and entire effects of the changes successively taking place in his habitation, on his gradually altering constitution. The vigour and stability of his health are well known to be dependent on the equality or inequality of temperature, and the salubrious or distempered state of the atmosphere in which he breathes. The nature of his nourishment, equally affected by that state, constantly supplies the seeds of invigoration or quick decay. Excesses, no doubt, shorten the lives of thousands, but they limit not the general standard of the age of man.

Some of these conjectures on several great changes, not all at once but slowly and gradually effected during several centuries subsequent to this great revolution, seem strongly countenanced by the situation of islands in several parts of the world pointing out a once continued shore, the broken barrier of former interior seas now thrown into and levelled with the ocean; they are farther strengthened by the original traditions of still existing seas, much more extended in former times. All these successive alterations on the face of the earth become probable as the most natural, and in reality the only assignable causes of the constitution of men, not suddenly but slowly and progressively, impaired during the course of several ages succeeding the deluge. From the immediate effects of that catastrophe,

strophe, his general age became reduced from upwards of 900 to under 450 years. To some new and no less sudden alterations must be attributed its being curtailed 200 years more after the birth of Phaleg. From that time it gradually decreased until about 1500 years before Christ, when it became fixed and stationary under 100 years.

The breaking up and dislocation of the ancient surface of the antediluvian earth, the evident marks of which are yet legible in its present both exterior and interior structure, sufficiently account for the appearances of its mountains and valleys, and for the diversely-altered stratification of their parts. The consequent violent displacing of the waters, which had in the first instance inundated it, no less evidently discloses the causes of those vestiges of their ravages every where apparent. Their united effects amply solve the question of elephants' bones and of the relics of aquatic animals, and particularly of the great abundance of shell-fish, of exotic fossil woods and plants, found on the tops of mountains or deep buried in the plains, however distant from the only climates now congenial to their growth. The probability of a very different temperature in the pristine state of the whole earth, makes it still less difficult to account for phenomena which must otherwise seem inexplicable.

If there are many mountains and parts of the earth which apparently owe their formation to, or have visibly undergone the operations of, fire, the certainty that, during the war of contending elements

raised by such convulsions, innumerable fires must have been kindled in the bowels of the earth, occasioning the most dreadful earthquakes and volcanos in parts where these are unknown to the records of history, ceases to make such appearances wonderful.

Upon the whole, the immediate or progressive effects consequent to one great revolution, confirmed both by the subsequent infant state of mankind, and by the consentaneous traditions of all nations, satisfactorily account for every appearance of the visibly at some time altered structure and disposition of the earth, without recurring to imaginary explications, frequently contradictory to one another, and not seldom to the general well known laws of nature. The principal aim and tendency of many of these ingenious systems have been, either to set aside or explain away the Mosaic testimonies on the creation and deluge. But if it can be shewn, as I have no doubt it may, by pursuing the path, however faulty in details, I have sketched out, that the testimonies of nature are not only not repugnant to, but are corroborative of, the narration of Moses, there remains little doubt of the preference it demands over the unsupported reveries of modern philosophy.

Whilst these Letters were in the press, two volumes of Dr. Hutton's Theory of the Earth appeared. As the public has both our opinions before it nearly at the same time, that public can alone decide on their respective merits. Most of the subjects forming the
basis.

Basis of his system having been already discussed, I shall be short in my observations on them.

This new system seems to be chiefly drawn from Mr. de Buffon's, with the difference of perpetually renovating powers having no determinate commencement, instead of a once slowly forming and now gradually decaying principle. The French author supposes a beginning to the present state of this terraqueous globe, and fixes it to a period of 75 thousand years before the present times. His countryman and disciple Mr. Bailly, in his first system, only wishes for sufficient time to derive all population from the northern pole, originally the only part of this earth on which man could rest his foot : but too well versed in history and antiquity not to have perceived every where the authentic testimonies of a general deluge, in his second he barely contends for the prolongation of a few hundred years to its date. Dr. Hutton rejects all time. The operations of his living renovating nature scorn all limits. "Time," says he, "which measures every thing in our idea, is to nature endless and as nothing." Mr. de Buffon removes the first production of man to about 6700 years ago. This author says, if we are to take the written history of man for the rule by which we judge of the time when the species first began, that period would be little removed from the present state of things. The expression implies little reliance on its authority. Profane-written history is indeed modern and fallacious. The review of population in times more

recent shews its varied statements of the first existence of the present race of mortals too far removed. But both history and tradition mark the utmost stretch of its commencement, by much too limited for Dr. Hutton's ideas. What credit he gives to the Mosaiical history, which places this beginning of man at a very short distance, I shall not presume to guess. He at least allows, that we do not find in natural history any document by which a high antiquity might be attributed to the human race. But with regard to inferior animals, and to testaceous fish in particular, this is not the case; these indeed, if not eternal, must have existed according to the system for millions of years. Dr. Hutton confesses that this globe was evidently made for man, who is by his intellectual faculties the sovereign of all animals—the sole being who can contemplate and enjoy the contemplation of Nature, who can in many cases dispose of, direct, and ameliorate her processes: yet he here seems to admit, that he was but as it were of yesterday, whilst his creative testaceous fish had been millions of years forming and renovating the future theatre of his superior powers. Surely his living, organical, and organizing nature might have found some earlier means of forming her chef-d'œuvre, fully to enjoy and to admire her works. Without it, they remained for so many ages incomplete and without end. As well as inanimate substances or less happily animated beings, man decays and revives in his posterity. The means to be devised of his first spontaneous production may indeed require great ingenuity, and in the end prove fully as metaphysical and as abstruse as those
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of Mr. de Buffon ; but certainly this one more effort of genius is wanting to complete the system.

For the formation of calcareous matter, Mr. de Buffon confines the quick propagation of testaceous fish, and the great deposition of their exuviae to 20 thousand years. He had determined only a small part of the surface of this globe to be composed of their exuviae : this author on the contrary, contending from the survey of a part of Scotland and England that a very great portion of its materials are compounded of them, requires an indefinite space for the labours of these small creative animals.

Having already discussed this surely extraordinary, though very generally adopted, formation of so considerable a part of the matter of this earth, I shall now only observe, that I cannot see any reason why God should not have created, or nature have produced *ab origine*, calcareous as well as other substances, to make up the sum of that variety suited to different purposes of which this globe is visibly composed. Shells are found immixed in the texture of some, though certainly not of all marbles, even in the greatest part of which no appearances of such are perceivable. They are often met with undecomposed in some calcareous earths ; but they are not uncommon in sands, in gravels, and in argillaceous earths, where whole beds of them have been discovered. If the description Mr. Wallerius and I have given of the former state of the earth, and of the effects

effects preceding, attending, and following the deluge, are not only not repugnant to reason, but from many related circumstances highly probable; can there be any wonder in finding these shells dispersed in many places which may have been once covered with seas now disappeared? Without even attending to these antediluvian seas, whose bottoms are now perhaps elevated into mountains, if the whole earth was once submerged for one twelvemonth only under one general sea, whilst the waters on and under the earth were stirred up from their deepest recesses, transporting during that sufficient time from pole to pole whole tribes of these testaceous fish, together with the beds on which they then as well as now were bred and fed, can we be surprised to find them scattered on parts now distant from the ocean? Calcareous earths, as composed of the finest particles more easily triturated and immixed with the waters, would naturally be the first dissolved and the last deposited by them, when they abandoned our present lands; and in or under this matter these shells will consequently be most commonly found. But these substances together with their shells are often consolidated, and that could not have happened but under the sea. When Dr. Hutton, in opposition to the evidence of our senses, can prove that no consolidation or lapidification can take place but under its waters, we shall admit this reason. In fine, notwithstanding the authorities of Mr. de Buffon and of this learned author, I own I shall be rather apt to think that these shells are calcareous, because the animals who bore them received their chief nutriment from calcareous substances, and more especially perhaps

haps from the calcareous earth contained in sea-salt and sea-water, than be induced to believe that the whole mass of calcareous matter is composed of their exuviae.

But from every argument to be deduced from the supposition of a deluge, this author excludes us. In defiance of the general testimony of mankind to that event, not to interrupt the unceasing processes of his organical living nature, he at once discards it. To give that deluge no higher authority, it is certainly founded on the consentaneous traditions of all ages and countries, and confirmed by the state of mankind in times more recent and well known. To dismiss such testimonies as undeserving of attention is presuming, beyond the bounds of permission, on the infallibility of our knowledge of those principles and operations of nature, which the very variety of the opinions of its expounders shews to be uncertain. If a deluge ever did happen, it must render nugatory all these philosophic dreams explaining the present state of the earth independent of the changes it must have wrought. A diligent examination of its probable natural causes and effects, though with less ingenuity, is more likely to account for actual appearances strongly marked with the features of convulsion and disorder, than fluctuating and ever-contradictory systems, which never can obtain in any degree the authority or credibility of that so well attested epoch of mankind. Following only the very natural effects of a revolution, capable of producing a general deluge, I have thence endeavoured to account

for the present state of the earth. That revolution, however great in itself and in its consequences to this globe, is certainly within the reach of possible natural contingencies. For the accomplishment of that and of every other change which may in future be wrought upon this planet, God had from the beginning pre-ordained agents to fulfill his will at the appointed time. These, as well as the more usual order of things, are in nature, and will have no less certain effects. The combustibles and other materials proper to produce fermentation had been silently forming and gathering in the bowels of the earth for ages before that great explosion of Vesuvius which happened in the time of Pliny. In the detail of causes and effects producing or following the deluge, I may be often mistaken; but that event, than which no fact in history is better attested, is certainly as adequate as likely to have produced that derangement which we now perceive in the outward structure of this earth. If I have not succeeded, my deficiencies may be supplied by abler hands. Philosophers delight in creations of their own. That deluge stands in the way of many an ingenious system; but to refute it they must shew it to have been impossible. Whilst partial earthquakes and volcanos occasionally overturn great tracts of country, swallowing up whole mountains on one hand and raising new ones on the other, they must demonstrate that an universal earthquake, as much more tremendous as more extensive in its effects, is not within the power of causes which might have existed in nature.

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On the formation of all calcareous substances from shells, a proposition neither proved nor probable though here taken for granted, and another postulatum no less controvertible, viz. that the whole matter of this earth has been in fusion by fire, because the greatest part of it is said to be indissoluble in water (*g*), the whole basis of this system is laid. As well as the former, this last I have already discussed in examining Mr. de Buffon's opinions. What is here added is, that it was so under the pressure of the whole mass of waters, and that by fusion and under that pressure only true consolidation and petrification can take place (*b*).

The French philosopher, knowing the natural impossibility of waters sojourning on matter in a state of fusion or even of incandescence, gives this globe 25 thousand years to cool in order to fit it to receive them. Our bolder author overlooks the difficulty. He observes that volcanic fires do break out from under the bottom of the sea: therefore such fires may not only there accidentally be kindled, but constantly exist. As if these partial fires, instantaneously kindled and as suddenly extinguished when in contact with its waters, could in any degree prove the constant state of fusion of the whole interior frame of this earth under their immediate touch. Dr. Hutton indeed supposes that this fusion is not, as in Mr. de Buffon's ideas, occasioned by the state in which this planet issued from the sun, but by the effect of subterraneous (*i*) fires and furnaces coeval with it and still existing undiminished. From these fires proceed

ceed volcanos and earthquakes. He will however permit me to observe, that the causes of volcanos and earthquakes are pretty well known to naturalists, as, by the mixture of sulphur and iron with water under factitious mounds, they can imitate them very perfectly without the aid of extraneous fire (*k*). No such central furnaces are therefore necessary to account for them. Mr. de Buffon imagines this globe to have been expelled from its parent sun in a state of fusion gradually cooling, but thence yet retaining a central fire, far below the bottom of the sea, which will at length like all terrestrial fire burn out. Dr. Hutton pretends this central fire to have burnt for millions of years, and to continue kindled for millions of years to come, notwithstanding those emissions which have formed our metallic veins, and those which keep up our volcanos. It must either be that same fiery fluid which is supposed to burn in the sun without fuel and without loss, or he must supply it with pabulum. Unrestricted as to time, he thinks proper to employ the combustible matters, not of one but of two or more anterior earths, to feed his subterraneous fire. This is pure imagination, but not philosophy. The fire which he supposes to have been burning for so many millions of years must in that time have consumed, calcined, or evaporated, the whole substance of this globe, and with it have expired. Notwithstanding these untoward objections, this deviation from his original is not without its use. From the well-known effects of entire fusion it has been demonstrated, against Mr. de Buffon's theory, that the present state of those substances called primitive, which

which he affirms to have been in fusion, shews that their liquefaction by fire is absolutely impossible. From the compression of superincumbent waters, Dr. Hutton endeavours to evade these natural and necessary effects of fusion. This compression modifies all those effects. This he explains by the example of stones thrown up by volcanos which appear to have suffered little in their texture, though liquid lavas may be at the same time emitted. There seems no real analogy here. Whilst the matter composing liquid lavas has felt the full effect of fire, and pumice stones are greatly altered, these stones appearing little damaged have undoubtedly been torn from the sides of the mountain by the instant effect of the convulsion, and falling into the boiling caldron are thence immediately exploded. Dr. Hutton has to account for adventitious substances inserted without change in the interior, or for a great variety of distinct substances forming, except the cement, the whole texture of solid bodies said to have been in long and therefore perfect fusion. Can these erupted stones which have barely touched the fire give the smallest explanation of the heterogeneous appearances of immense strata pretended to have been liquefied by that element, whose known operation in that case is to mix all substances so perfectly as to compose from them a new homogeneous matter? Satisfied, however, that he may elude the constant effects of his great agent by the imagined compression of waters, which in the order of nature could not have rested for a moment on matter in fusion, the author determines that

all the various strata of our present lands have been in fusion under the bottom of former seas, and there consolidated by refrigeration.

Messieurs Raynal and Pallas had imagined a successive change of seas and lands: the one by the perpetual incroachments and derelictions of the ocean, the other by volcanic fires. Dr. Hutton, not satisfied with these expedients, having constructed the present continents from the decomposition of former lands in the manner we have seen, asserts that nature, which is ever living, and by her perpetual changes of decay and re-construction ever renovating this globe, is now preparing under the ocean new substances and new lands from the ruins of the present. How many millions of years ago our actual habitations were formed under its waters, we may judge from the very slow progress of their decay and the still slower progress of their final deposition in the deepest parts of the sea. But to bring together the materials, and mould at will during thousands of ages the present or future earths, is not the most difficult task of imagination; the most stubborn still remains behind: the means of raising from the deep abyss these lands, when formed, to their present height above the level of the sea, and to maintain them there when so uplifted, are not so obvious. His ready central furnace furnishes him with powers to accomplish the former part. The force of fire and steam is incalculable, and therefore there is no mass so ponderous which it may not raise to any height (1); but
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how to preserve it steady for so many ages in that unnatural elevation, it should seem the doctor has not yet found out. To him I shall certainly leave it.

In the mean time he will give me leave to examine that process of decay and re-construction which certainly takes place on this globe. He maintains that all our present lands will one day be washed away into the ocean, which, whilst it overflows that part of the globe which we now inhabit, will raise up new lands from its bosom. To know whether this can ever happen in whatever succession of ages, without a convulsion such as we apprehend to have been experienced at the deluge, it will be necessary to attend to the effects of decay and diluvion which nature presents before our eyes. The summits of our rocky mountains moulder away, however slowly, and the same thing happens in a less degree to lower eminences. Let us see what becomes of their broken and shivered ruins. By much the greatest part of them falls at the immediate feet of these crumbling mountains, where it constructs sloping banks extending their dimensions at the expence of their height. These new banks are in time covered with grasses, plants, or wood, defending them in great measure from the attacks of rains, air, and winds; and thereby the bases of perhaps originally upright rocks are both extended and consolidated. By the same means deep valleys are gradually cumulated. Another part of these spoils is swept away by rains into torrents which take their rise in mountainous tracts.

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There it in the first place elevates the beds of these torrents, and whatever is not arrested in them (and that part is very considerable from the obstruction of larger fragments) is carried by them into larger rivers: the beds of these are also heightened, and no inconsiderable part in every inundation is diffused over the adjacent plains, elevating their general surface. By the impetuosity of the waters, some part is hurried down to the mouths of rivers, where it raises sand-banks, and gradually extends the coasts, or forms new islands, at no great distance from the land. A very small share of the whole is by high tides and tempests swept into the deepest parts of the sea, there to fill its cavities, and by a still slower progress by degrees elevate the general bed of the ocean. Hence its waters too will also at length be raised above their present level. The mouldering summits of those high cliffs which overhang the sea fall at their feet, and raise their bases above its waves, and more immediately by such incroachments on its limits extend the land. In time, those actual boundaries of its waters will, instead of steep precipices, present sloping banks, backing and strengthening the new lands composed of the ruins of their former heights (*m*). Such are the real processes and effects of the very gradual decay of our mountains and eminences wherever situated. Let us now suppose, no matter in what number of ages, all our highest mountains reduced in their height from 3000 to 100 toises. What will have become of their ruins? At least two-thirds will have extended their bases and raised in a smaller degree all the circumjacent country;

try : of the remaining third, great share will have been arrested in torrents and rivers, or have raised the surface of the lowest plains : what is hurried down by floods to the sea will have there raised new lands and islands ; a very small portion, not a hundredth part, will have reached the deep. The contraction of the ocean aided by these depositions will, no doubt, have somewhat raised the present level of its waters, but certainly not in any proportion with the prior elevation of the lands. The general surface of the earth, so much more raised by a greater share of the spoils of its mountains than can have been the bed of the ocean, will have maintained a still more considerable proportionable elevation above the level of its waters than it has at present. Our highest mountains, become very gently-sloping hills, will be defended by grasses, plants, and woods, from any further considerable depredation, whilst the great causes of degradation will be diminished. The contracted surface of the sea will furnish less to evaporation to charge the air with superabundant moisture : the clouds, no longer attracted and broken by the aspiring summits of high mountains, will give less frequent and less violent rains. The boisterous torrent and the impetuous river become gentle streams will carry little to the sea to raise new lands, and still less to the deep to raise its bed. What may yet be washed away from one part of the land will only change place to raise it in another. Hence, from the unerring testimony of the course of nature, I will conclude with the scriptures that the waters of the ocean shall never rise again to inundate the earth.

If Providence designs this globe to subsist a length of time sufficient to effect all these changes (and, unless the great Disposer of the universe direct it otherwise, no others can take place, because such alone are in the real process of nature), it appears evident to me that the aspect of this earth will gradually approach to that same state which Mr. Wallerius and I have imagined to have existed before the deluge. When our mountains shall have been reduced to gentle hills, eternal ice and snow, even in northern climates, will no longer top their summits to chill the air and earth below. The loud tempest and the hurricane will be hushed. The spoils of mountains will have enriched and fertilized as well as elevated the general surface of the earth. The high platform of Siberia and Tartary will have been washed down, to render the extensive sandy deserts below it capable of culture. The habitation of man will be every where extended and improved. Islands contiguous to continents will be joined to them. Ireland will be united to Great Britain, and this last to France. Fear not, Britons: even to fill up these narrow channels at least a million of years will be required. The string of Maldivia and Molucca Islands will be by degrees joined to India and China. Those in the Gulph of Mexico will, by a chain of land, be again united to America. The numberless isles of the Adriatic and of the Archipelago will connect Italy with Greece, and this last with Asia. But in all these cases there will still probably remain for ages interior seas and lakes. The streights of Constantinople and of the Dardanelles filled up will again shut up
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the Black Sea, and that of Marmora. In like manner will the streights of Gibraltar and of the Red Sea be again closed by the rubbish of the mountains now surrounding them. New islands will arise in the ocean, and the increased numbers of mankind will every where be provided with new lands. In short, this globe will nearly resume the features of the antediluvian world. Having brought, in imagination, the degradations of our lands to an almost stationary point, we must there leave them, to await the decrees of that power who can alone preserve or destroy what his will created into existence. Such are the changes warranted by the actual processes of Nature, which no length of time can ever alter, unless by the special command of that Great Being from whom she received all her laws; our continents can never be totally washed away and their places occupied by the waters, nor new lands raised from the bottom of the ocean, unless by hidden interior causes of convulsion which man can neither investigate nor reason upon, or by some derangement in the course or position of this planet. Philosophers have no right to prognosticate for futurity, but from visible actually-existing operations of nature.

But before I take my final leave of Doctor Hutton, I must observe, that his all-powerful, wise, and ever-living organical and organizing nature is a non-entity, a mere metaphysical abstract idea. By that word nothing can be understood but inanimate senseless matter, and the aggregate of those laws by which it is governed.

564 THOUGHTS ON THE STRUCTURE OF THIS GLOBE.

If a superior intelligent Being formed at will the whole substance of this universe, and impressed on it those laws by which it is with infinite wisdom directed to the purpose of his design, it is immaterial whether he willed it six thousand or six millions of years ago. The first opinion, with respect at least to the present state of this our planet, is supported by every evidence which reason can require : the second is possible, and on that possibility only can be grounded.

NOTES

NOTES AND ILLUSTRATIONS

TO

LETTER VIII.

(a) Page 528.

THE learned Mr. Huet, bishop of Avranches, pretends, in his History of the Navigation of the Antients, that men had not built either great or little ships before the deluge, because, says he, if navigation had been known, others than the family of Noah might have saved themselves from the deluge. Mr. Wallerius is also of the same opinion, because the ark, the description of which resembles rather a great box than a ship, appears to have had neither keel, nor stern, rudder, nor sails. Both these arguments are equally inconclusive. Had the antediluvians possessed ships equal to the largest of ours in the present perfection of ship-building, could they have resisted a continued tempest of many months, raised not by partial winds, but by the confusion of the elements and the wreck of the globe itself? Not many years ago, we saw ships of war driven from their moorings in the best ports of the West-India Islands and sunk by a hurricane, and the Ville de Paris of 110 guns, with some other 74 gun ships, lost in full sea, by a storm of somewhat unusual duration. What ship or what art of navigation could have saved men from destruction, when the sea rose above the highest eminences and covered the whole earth without shore or limit, whilst the whole earth under it was convulsed by dreadful earthquakes, and sinking into vast abysses? Under such circumstances, neither construction, rudders, nor sails,

sails, nor the most skilful art of mariners, could preserve the stoutest ships from perdition, even had the tempest lasted as many days as it did months. The ark alone was under the guidance and protection of the Almighty, and God probably directed it to be built in an unusual shape without art, that Noah might be sensible that in him alone he was to place his whole confidence and hopes of safety. The patriarch himself, shut up even from the sight of the dreadful ruin which surrounded him, was totally passive and inactive. Navigation has ever been one of the first and most successful attempts of the most savage people inhabiting sea-coasts; and for a small number of persons their boats and canoes have been ever found sufficiently ingenious and well adapted to the nature of the adjoining seas. We can have no reason to suppose that the antediluvians were immersed in savage ignorance. Adam was instructed by God himself, and he was soon surrounded by a numerous progeny. The longevity of his race not only was calculated to preserve but to improve every knowledge that men acquired. The earth, though cursed after the fall, yet produced, with little labour: all its climates were moderate, and mankind had yet full leisure to employ himself in arts and study. How happens it that in the new world we yet see to many nations profoundly ignorant? As I before observed, those tribes who travelled not far from the place of separation at the dispersion forgot not their former arts, but sat down in society in fertile countries and in happy climates; but those who wandered to great distances, especially towards the north, soon got entangled amidst vast forests and morasses, and separated, in quest of scanty food, into very small parties. Many of them lost their herds and flocks, and were reduced to live on spontaneous roots, or to earn their food by hunting, which separated them still more from intercourse with each other. In such a course of life these isolated families soon lost all remembrance of former arts or knowledge, and habit endeared this savage independence to them. In the antediluvian world, in which all excesses of heat or cold were yet unknown, where every clime was fruitful and benign, no such cause of brutal degeneration could take place. If the lands were, as I have described, intersected by frequent but comparatively small

small seas, undisturbed by high tides or violent tempests, very little art in ship-building or navigation was necessary; and it scarce can be imagined that mankind could subsist above sixteen centuries, without taking possession of that agreeable and convenient part of his domains. In those tranquil and less extensive seas the simplest sails would suffice. Though the air was unagitated by hurricanes or tempests, it was not stagnant; and both some kind of sails and directing rudders would be necessary. In general, some sort of galley with oars and sails in the simplest form would be sufficient for short trips on calm seas. Even should the picture both Mr. Wallerius and I have drawn of the aspect of the antediluvian world be imaginary and false, it is not probable that the advantages of navigation should have been so long neglected.

(b) Page 533.

It seems to me that the great features of the deluge are in general imperfectly conceived or little attended to. We judge of it from partial inundations, which may happen in particular countries. Incessant rains, attended with violent hurricanes, driving part of the waters of the sea beyond their bounds, joined perhaps to the breaking down of the mounds of lakes, may, for a short time, inundate the low grounds of extensive tracts. But how shall we, with such means, imagine the whole earth to have been overflowed for 150 days, without any decrease in the inundating waters? Rains and the whole water of the atmosphere are inadequate; and the waters of the former seas could not answer the purpose. They could not totally have deserted their own beds and left them dry, to spread themselves over the higher land, so as to overtop all the eminences of the earth, however diminutive in comparison of our present mountains; much less could they maintain themselves in that unnatural elevation, whilst lower parts remained unfilled. But let us advert that the fountains of the great abyfs were at the same time broken up. The same quantity of water, no doubt, existed then as now; but the land was probably more extensive in proportion to the sea. Great reservoirs of water still remain under the earth; before the

deluge, a much greater portion was hidden under its surface. When this was rent by earthquakes and volcanos, these waters burst forth (as yet sometimes happens during earthquakes) with a force which we see feebly imitated in water-works, and added to the flood a quantity of water perhaps not very unequal to that of the former seas. The waters had prevailed upon the earth during 150 days, when they were commanded to subside. How was this effected? Where did they retire to? In my conception, new convulsions now took place, by which hitherto-untouched inferior caverns were burst open, swallowing up vast portions of the former land, and thus gradually preparing new, deeper, and more extensive beds in the present ocean, to receive their superabundance. It was then that the waters were hurried backwards and forwards, as the scripture tells us, rushing this way or that, towards new gulphs and cavities, successively opened to receive them in various parts of the earth's circumference. From the effects of such tremendous agitations, can we be surpris'd to find the spoils either of the sea or of former continents promiscuously scattered over, and often deep-buried under, the surface of the earth? By the sinking in of the whole land around the antarctic pole, to form one vast though shallow sea, the globe became more consolidated in that part; the centre of gravity was thereby changed, and the track of the earth diverged from the equinoctial line. The shock thence occasioned must also have had mighty effects, and, though the lands of the northern hemisphere stood firmer, it may have drawn after it the total disrapture of its continents and the formation of the Pacific and Atlantic seas. The whole bed of the present ocean was at length completed. The cavities which had been opened by these repeated convulsions under our remaining continents and islands were filled up by the sliding in of great portions of the surface on one hand, whilst, on the other, it was in many places elevated far above all former level. New chasms and caverns were formed amidst these ruins, into which the remaining waters ran, to fill still subsisting reservoirs within the bowels of the earth, and totally to liberate its surface.

(c) Page 535.

Whoever has travelled through mountainous countries must have observed them traversed in some parts by narrow chasms, where the rugged faces of impending rocks with corresponding strata frown at each other, and in others, by valleys presenting, on one side at least, if not on both, the sloping declivities of mountain-backs. There we see the fracture itself which rent those rocks asunder : the ancient level has there been high uplifted into air : here we behold them dipping into the bowels of the earth, to fill up some deep cavern burst open under them. If in the plain a shaft is sunk, we shall find the same strata as appeared on the face of the precipice dipping under ground, in the very same order and with the same inclination as down the mountain's back. If one or more of the superior strata are wanting, either on the declivity or within the earth, it is because they have slipped off in the fall ; and their confused ruins will be found to form the soil at the point of junction between the hill and the plain. Mr. Whitehurst, in his inquiry into the original state of the earth, has given plates, in which are delineated these inclined strata from the tops of the mountains, where they appear in open day, to the greatest depths penetrated by mining in Derbyshire and the north of Ireland. When the convulsion which occasioned these effects was confined to small corners of a country, the delineation is easily followed : but where vast portions of the earth have been at once affected—as, for example, the continent of South America, from the height of the Andes, to meet the bottom of the Atlantic ocean at several hundred leagues distance—the traces of the whole are difficult to be seized. The difficulty is still greater, because the general inclined plane is frequently interrupted by the effects of partial fissures incident to such a shock producing a variety of intermediate breaks and inequalities. If the operations of partial accidents are discoverable on many parts of the inclined plane, the much stronger effects of the general shock which overturned the site of the whole country are still more frequent and more visible amongst the stupendous mountains elevated by it on the western coast of that conti-

ment, dividing them into various chains and fractured portions: Such seems to have been the convulsion which at once changed the whole face of the earth, excavating new, deeper, and more extensive seas, shaking the foundations of remaining continents, and elevating plains or little eminences to the stupendous height of our present mountains. In the vicinity of mountains, there are other observations confirmative of this their origin frequently to be made. The waters, which at the deluge covered the whole earth and its comparatively low eminences, ran not quietly off towards the newly depressed and enlarged bed of the ocean. Innumerable explosions on every side agitated them to a degree which imagination cannot picture. In those parts where our mountains are now reared, whether former seas, plains, or hills, they were suddenly and violently thrown off from the rising heights, and their impetuosity and ravages were proportionably great. Wherever the soil was less firm, or fissures gave an opening, they tore up and excavated deep ravines. Where these are found, particularly in such ranges as are overtopped by still higher mountains, we generally see mounts formed in a conical shape at the foot of these hollowed cliffs, sideways indeed to leave a passage to the torrent towards the lower plains and the sea, but always on the higher side. These were formed by the rubbish torn from out of these channels, and, as would naturally be the case, are gradually lessened towards their summits, as the muddy torrent subsiding furnished fewer materials. This observation seems to have been first made by Mr. de Maillet in his *Telliamed*. Remarkable instances of this are to be seen in travelling from Brough under Stanemore towards Penrith. On the right-hand side, where a lessening chain of mountains are prolonged from Stanemore and from Crossfell, which overtops them from behind, there are several such water-worn ravines, having each on the side towards Brough its conic mount, higher towards Brough, and gradually less elevated towards Penrith and the sea. That such deep channels should, as Dr. Hutton wishes to persuade us, have been worn out through beds of rock by their present scanty rills, in whatever fancied number of ages, is too absurd to think of. Whatever their waters do corrode is much more than compensated.

fated by arrested rubbish from the heights. A larger fragment of stone, or a branch of a tree falling across, accelerates this operation ; so that in fact the scabres, instead of being deepened, are daily cumulated. On the left hand of the road from Blandford to Shaftsbury, amongst many indications of the retreat of the waters which had once covered those high downs, is a remarkable semicircular basin at the head of a small valley beneath, which bears evident marks of having been either scooped out, or at least shaped to its present form, by the impetuosity of falling waters. One may distinguish on its sides where the currents have been strongest, corresponding to the greater declivity of the encircling eminences from whence they rushed. Insulated mountains have been formed, either by the depositions of the impetuous diluvian torrents, by earthquakes and volcanos, or by the perpendicular sinking of the earth around them, leaving them with all their ancient horizontal strata in their original position. It is in very few parts that the original features of the earth remain undisturbed. To the deluge we must look up to account for its actual exterior structure and appearance. In every corner of it, visible and not to be mistaken marks of dislocation confirm this truth.

(d) Page 536.

Captain Cook, in his repeated voyages round the antarctic circle, constantly found innumerable isles and fields of ice obstructing navigation in latitude 61 and 62 south. Having, however, penetrated as far in some parts as latitude 72, he there found a firm and fixed continent of ice, on which he descried vast accumulated mountains. From repeated and judicious observations, he pronounces this to be owing, not to the proximity of lands, the islands which he called Sandwich in latitude 59 being the last which he descried towards that pole, but to the shallowness of that sea. The accumulating snows and ice sinking there to the very bottom, become immoveably fixed to it. In the northern hemisphere it was not the proximity of land which stopped his progress, for he passed Behring's Straights ; but though the lands diverging from thence on each side open a more extensive widening sea, he was again stopped by an icy

continent in latitude 70 north, because he perceived the sea was there become so shallow as to suffer the ice to be rooted to its bottom. On the opposite western side of the hemisphere, it is well known that the sea, though sometimes covered with floating ice, is passable in the proper season, and even becomes less obstructed as far as latitude 88, to which by various accounts it appears that some ships have penetrated.

(e) Page 536.

It is very possible that some small change may have happened in the distance of the orbit of the earth from the sun. The circumference of this globe, whose outward frame was formerly supported on greater and more numerous vaults, or, as Mr. de Luc imagines, on three several ranges of these one above another, became generally somewhat lessened in magnitude, though much more irregular, whilst its interior became more compact and consolidated. This lessened diameter and increased density would draw it proportionably nearer to the sun.

(f) Page 541.

To the highest mountains of the earth, generally composed of vitreous or vitrifiable or what they style primitive matter, Mr. de Buffon and almost all modern philosophers have given the name of primitive, or of first formation. Lesser mountains, composed of calcareous substances or of visibly posterior aggregations, they have denominated secondary: to these last some have given the name of tertiary. According to the ideas I have suggested, the highest mountains, though they may have possibly been in part primitive or antediluvian hills, cannot truly be called of first formation. On the contrary, they have all been evidently dislocated, uplifted far above their ancient level on one side, and sunk on the other by that convulsion which occasioned the deluge. I have already shewn that the distinction between primitive and secondary matter is imaginary. In the present altered state of the globe, the really primitive antediluvian eminences are no longer to be discriminated. But if we date from the deluge only, the first mountains, great or small, or of whatever matter composed, raised by the
I
convulsion

convulsion which occasioned it, may be called primary in the present structure of the earth. To these may justly be deemed secondary those mountains which have been formed from the depositions or sediments of the waters which for near a year covered the whole earth, or of those which for many succeeding years probably prevailed over a very great part of it, and finally of those which for some centuries were contained in many great interior lakes or seas, long since wholly or in part run off. Mountains which are composed of confused aggregations caused by impetuous torrents in the retreat of the waters towards the present ocean, or by the sudden rupture of the barriers of former lakes or seas, may with equal propriety be called tertiary. A fourth class may be reckoned of mountains raised by volcanos, either under the waters or where the land just uncovered was yet encompassed by them. These in the first ages after the deluge would be much more frequent and more general over the whole surface, from the much more frequent and violent conflicts of the elements within the bowels of the earth after the great convulsion which had shaken it to its centre. The first kind of mountains will rarely contain any fossil shells. Even if such had been bred in former lakes or seas which may have covered part of them, they would be shaken off their falling backs when part of the former surface of the land sunk into the caverns of the earth. The second will often contain marine shells, frequently in large beds, or diversely mixed with other substances whether vitreous or calcareous. In the third will be found a confused mixture of marine and fluviatile shells. In the last, where fire has reigned, few remnants of them will be seen, though they cannot be entirely excluded from such as have been raised from the bottom of the waters. The first, though they cannot be called primitive mountains, have, however, the best title to the appellation of primitive earth, though torn and dislocated. All other parts of the surface have probably undergone still greater ravages and alterations.

(g) Page 555.

Siliceous matter, says this author, is not soluble in water. Yet he allows that the water of Giezer in Iceland contains that substance in solution,
and

and he agrees that the Chevalier Dolomieu had discovered a means of dissolving it in water by the addition of an alkali. Notwithstanding this fact, further confirmed by the analysis of the Giezer water by himself and Dr. Black, he resolutely persists in asserting that the liquefaction of siliceous substances serving as a cement to consolidated strata could not have been performed but by fusion in fire. Pure water is certainly not an universal solvent; but is there any want of acids or alkalis in nature by whose aid it may become so? As I have before observed, there are many substances, and these great component parts of the strata of this earth, including most of what are called primitive, which may be calcined or evaporated, but are not, as far as we know, fusible in fire. The cements which unite that variety of matters forming granites, &c. are generally either calcareous or siliceous, and both of these we see are soluble in water by the aid of acids or alkalis. Should the cements be of another nature, it is not surely unnatural to suppose that water or moisture may be impregnated with various menstrua, amongst which phlogiston will act no inconsiderable part, by some one of which every substance may be soluble. The author maintains that sulphur and bitumens cannot be dissolved in water. Whether sulphurs are dissolved in water, or its principles in the air which they contain, may be a point of dispute amongst chemists; but certain it is that many waters are the vehicles of both sulphur and bitumens. Quite contrary to what it appears to Dr. Hutton, it seems to me, that, if all the various substances contained in a solid mass had ever been in a state of perfect fusion, few of these could retain their primitive figure or interior texture; but if in general the cements only of these masses were in solution by water, and afterwards deposited and concreted around these conglomerated substances nowise dissolved, these so inserted or so agglutinated will naturally appear in their original form and texture. Flinty bodies insulated in chalk or sand, so far from being proofs that the whole had been in fusion, appear to me rather evidences that the exterior matters surrounding them were deposited or superinduced over them by water, as it will presently appear. There seems no small reason to suspect that some flints are formed posteriorly by the decomposition of pyrites, or by other chemical operations

rions of nature within various solid bodies, and of course much more easily in loose strata. Coals originating, according to the Doctor as well as Mr. de Buffon and most other naturalists, from the decomposition of the vegetable substances of former earths, though he allows that their texture shews no signs of such origin, are to him strong proofs of subterraneous fusion. How the thin laminæ so visible in their whole texture came to be so little decomposed by even the most imperfect fusion, seems to me inexplicable. In the mean time I shall still think them more likely to be compounded of a slaty substance, which so frequently appears unchanged, or only half transformed in the upper seams, variously impregnated with sulphurs and bitumens, and by that variety forming more or less perfect coals.

(b) Page 555.

Whilst setting aside stalactites, which Dr. Hutton cannot but own to be petrified by water, we see so many instances of petrification by its medium, it is surely extraordinary that he should assert that petrification can only be formed by fusion. Mr. Paw, who certainly is no advocate for the Mosaic system, or for the short duration of this earth, yet as impartially as justly says: "Of all the attempts to calculate the age of the world, the system of petrifications is the most unphilosophical; it being impossible to ascertain a process depending on the quality and quantity of lapidific juices and other circumstances, varying *ad infinitum* in different places, according to the nature of earths, waters, and air, and even of the position of the bodies on which the experiments are made."

(i) Page 555.

Dr. Hutton in his reply to Mr. Kirwan says, he has not founded his theory upon the supposition of a subterraneous fire, but that this follows from the clear evidence of all mineral bodies and strata having been in fusion. So far, however, is this evidence from being clear, that, in order to reconcile the appearances of the great strata of the earth with fusion, he is obliged to counteract its known effects by a supposed compression; and that compression is water, which, according to the laws of nature, must have

have been repelled, thrown off, and evaporated by a body in actual fusion. We have never heard of the sea being in any part boiling; yet, according to him, still existing furnaces under it are actually there melting the spoils of our present lands for the formation of future earths. Were this the case, certainly not only its waters would be hot, but the whole ocean would be in the most violent fermentation of boiling. All this is clear evidence that it is not the constant effects of nature which compel the system, but that it is the system which strains to compel unwilling and refractory nature. Taking always for granted the fusion of all mineral strata, he concludes there must have been and still exists interior fire, for without its aid he would have no agent to raise the present or future earths after consolidation. Here again it is the system only which forces the necessity of a subterraneous fire; for if, as we are told in scripture, the waters ran off the earth into receptacles prepared for them by the depression of some parts of the globe, there is no necessity for this subterraneous fire, nor for its elevating power.

Mr. de Carofi having observed in calcareous rocks in the Palatinate of Cracovia the evident appearances of gradual transition from the state of pure lime-stone to that of siliceous veins and nodules, and having also discovered in those mountains a number of diffeminated pyrites either entire or in a half-decomposed state, has imagined that these last, with acids contained in abounding waters, are the chemical agents which have operated a real transmutation of calcareous into siliceous matter. This he thinks confirmed by frequently finding in the nodules of flint cavities containing sometimes concentric layers of calcedony, and sometimes of a yet calcareous spath, and in one instance the remains of the dissolving water; in others, pyrites partly decomposed are also found. Both he and Mr. Macquer assert, that from their accurate experience they find calcedony growing daily, not only in the solid body of gypsum, &c. while in the mine, but also in the solid stone preserved in their cabinets. Should this be ascertained, it places the real transmutation beyond all possible doubt. Mr. de Carofi also thinks he has perceived the transformation of sand-stone having a calcareous cement into siliceous nodules. Mr. Patrin has observed

served near the river Argun in Siberia, rocks interiorly of pure grey hornstein, converted gradually into lime-stone as their summits approach the atmosphere. Mr. Monnet, from the crystallization of transparent quartz within very pure lime-stone rocks at Champigny near Paris, is persuaded that it is not only the particles contained in solution in the water, but the water itself consolidated, which forms great part of these hard bodies. In a limited view this must be true, as there can, I think, be little doubt but that water forms a constituent part of mineral as well as of vegetable and animal bodies. But it is much more probable that by decomposition and re-combination the lime-stone itself is converted into quartz. To all these observations and opinions Dr. Hutton answers, that were it even certain (though he thinks it all illusion) that such metamorphoses and concretions do take place on the surface when exposed to all the chemical agents contained in the atmosphere, yet that the general conformation and consolidation of the strata of the earth must have a different origin, not because he has proved these seeming conversions to be impossible, but because such atmospheric influences could not have been exerted under the bottom of the sea, where he has determined that all was formed, concreted, and consolidated by fusion. Here we again find this author, instead of proving his igniform origin, decidedly rejecting as necessarily fallacious or partial every appearance not coinciding with his pre-determined system.

(*) Page 556.

Mr. Lemery was the first person who illustrated by actual experiment the origin of subterraneous fires. He mixed 25 pounds of powdered sulphur with an equal weight of iron filings; and having kneaded the mixture together by a little water into the consistence of a paste, he put it into an iron pot, covered it with a cloth, and buried the whole a foot under ground. In eight or nine hours, the earth swelled, grew warm and cracked; hot sulphureous vapours were perceived; a flame which dilated the cracks was observed; and a subterraneous fire producing a volcano in miniature was lighted up. The experiment has been frequently repeated.

It is to be observed, that too much or too little water will equally prevent inflammation. Pyrites, which are frequently found both on the surface and at all depths in the earth, are chiefly composed of sulphur and iron. (Vide Watson's Chemical Essays.) About 45 years ago, the experiment of imitating a volcano was tried at Paris on a larger scale—whether by the directions of the late Duke of Orleans, or of the Count de Lauragais, I do not recollect. The necessary ingredients were deposited under a mount raised for the purpose in a garden. A perfect volcano was thence exhibited, to the no small alarm of the neighbourhood.

Volcanos, according to Doctor Hutton, are not only the spiracula, but proofs of the existence of his subterraneous fire. It is surely surprising that a chemist should find extraneous fire necessary for the production of such phenomena. He must daily see inflammation and fusion produced without the aid of external fire. Without recurring to the less known operations of a laboratory, the simple and frequent accident of a hay-stack taking fire shews that substances in fermentation by moisture kindle into flame without the approach of visible fire. The electric shock, the striking of steel against flint, produce fire by liberating the latent element where before quiescent.

(/) Page 558.

Perpendicular strata, such as are much inclined, often leaning angularly against each other or against horizontal beds, and others bent into circular or semicircular figures, so frequently observed in the Alps with wonder by Mr. de Saussure, are to Doctor Hutton confirmations strong of the whole earth having been elevated from the ocean by the power of his subterraneous fire. But these appearances, however strange, are at least as easily, and I think much more naturally, accounted for by the convulsions I have described as happening at the deluge, when vast portions of the surface of the earth with all their strata were partly sunk into gaping cavities, and partly high uplifted into air far above their antient level. The observations of Mr. Whitehurst in mines, where the corresponding sunken parts may be yet followed, certainly confirm this system. By this
convulsion,

convulsion, former nearly horizontal beds would necessarily become inclined, more or less according to the depth of the cavity, from the precipice where the earth was violently torn from its ancient level to the very bottom of the cavern into which part of it sunk. Parts of the falling ruin would be fractured by the shock, and will thence naturally there exhibit broken and variously distorted strata. The perpendicular or much inclined strata of schistus under super-induced horizontal beds of calcareous matter, which appear so difficult to be accounted for by Mr. de Luc, and accounted for by Doctor Hutton, by having been raised from the sea by his expansive force, sunk again, and raised a second time to their present situation in the long succession of destroyed and renewed earths, seem easily explained by the probable existence of many lakes and interior seas remaining for some ages after the deluge, now either much contracted or entirely disappeared. Indeed I do not know any appearances in the actual structure of this earth, which may not either be attributed to the first subsiding of terraqueous substances by central attraction at the creation itself, when dry land was made to appear, and the waters which till then covered the whole globe were by that very operation made to retire into the beds or cavities prepared to receive them; or more commonly by the various convulsions which agitated the earth at the deluge. From the effects of that awful catastrophe—when the whole surface of this globe was dislocated, torn, and rent; when the basins of antediluvian seas were elevated into the midst of our continents, whilst great part of the former lands was sunk into the now shallow Pacific antarctic seas, thereby changing the centre of gravity nearer to the southern pole—can we be surprised to find the strata of the earth so much and so variously disordered and displaced? Some accidents are easily conceived to be the result of the breaking down of the mounds which upheld former lakes or interior seas in the first centuries succeeding the deluge. Many, no doubt, were occasioned by the frequency of volcanos and of earthquakes, during a long continuance of fermentation in all the elements, both in the atmosphere and in the interior bowels of the earth. That God who had miraculously protected Noah and his children would probably quiet the convulsion in Armenia; what

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happened during 400 years in the wide extended and yet uninhabited parts of the world is known to him alone.

(m) Page 560.

Our author supposes a quite contrary effect from the degradation of rocky shores. He says, when the sea undermines their bases the mountains tumble into it, and the waters hurry off the ruins into their deep abysses. That the general case is very different, every shore can tell. A mass of rock detached falls at the foot of the cliff, and by its weight sinks deep into the sand. Sinking deeper and deeper, it soon becomes immoveable, arrests and gathers round it lesser stones and rubbish; in time forms a mass of resistance not to be displaced by the most furious waves, till at length, by succeeding degradations from the cliff above it, a new sloping bank is raised above the usual level of the sea. This process is visible on every shore where the waters are not too deep to make this incroachment of the land upon the sea as yet visible; where the beach is shallow, a moderate stone, a piece of wood forms by degrees a sand-bank, and may at length an island. The tide returns with much less violence than it flows, and every coming wave adds more to the shore than its return withdraws. If tempests did not occasionally degrade this daily work, the elevation of the shores would, even from the operation of the sea itself, be more speedy and more visible. The winds too are not inactive in adding to the lands. Part of the sea sands is driven towards them by their violence, and by degrees raises extensive ranges of sandy hills along the shore. Partial instances of lands swallowed up or torn away by unusual hurricanes and storms break not the general rule. Nothing seems more certain than that the low lands and marshes leading to the ocean are very generally raised and extended, and the sea slowly contracted. In every part of the world, places known as sea-ports some centuries ago are now a few miles distant from the sea. The labours of man hasten in many parts this incroachment. If nature constantly acted in opposition to them, vain would be all his art and industry.

THOUGHTS

THOUGHTS
ON THE
STRUCTURE
OF THIS GLOBE.

LETTER IX.

CONCLUSIONS.

READY to give up every hypothetical or conjectural part of what I may have advanced in the foregoing Letters, so soon as more luminous or probable explications shall be offered, I must own, Sir, that there are certain points which appear to me incontestable, and others which carry with them all the appearances of probability which can reasonably be exacted in such matters by minds not pre-occupied by some favourite system.

It appears to me certain, that since the first existence of this globe there has happened at some period a general deluge, attested by still
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subsisting monuments of nature, and confirmed by the consentaneous traditions of all nations, in all ages, and in all parts of the world. This disaster must have been caused by some great convulsion capable of deranging the whole exterior coat of the earth ; and its present stratification indicates such derangement. Its consequences must have greatly altered and affected the constitution both of the earth and of the few inhabitants who survived the catastrophe. All ancient opinions and traditions concur in asserting it. Far from the possibility of removing the epoch of this great event to the distance of many thousand years, or to still more indefinite antiquity, as Mr. de Buffon and others, from the pretended testimonies of nature, and Mr. Bailly in his first work, from a forced interpretation of antique traditions, have maintained, I think I have evidently demonstrated, even with the more mature consent of this last author, that this great revolution cannot be thrown to a greater distance than 3500 years before Christ. I have shewn it probable that this utmost antiquity should be considerably reduced. Not only all authentic history, but even all those fables fabricated by the vanity of nations which restrict themselves to the existence of man, are limited far below that supposed period ; and the traditions of the more simple nations, such as the Tartars and Arabs, as well as Jews, determine the renovation of mankind to times considerably later. Beyond a period of even 1500 years before Christ, the boasted histories of the more polished nations present us with nothing but fictions and fables, variously combined, and afforded to the vain pretensions of particular nations contending for priority
of

of origin, but frequently founded on remnants of truths appertaining to the general history of mankind, assumed by each of these as the particular story of its race and country. Sir Isaac Newton has proved, that the first technical chronology of the Greeks had considerably ante-dated the primitive events of their history. From thence, subsequent chronologers transferred a like antiquity to corresponding events of other nations. The only probable or authentic documents of the state of mankind previous to 1500 years before Christ must be sought for in holy writ. Mutilated fragments of these form the ground-work, however variously altered, of whatever is rational relative to man in the annals or traditions of all parts of the world. There only can the real origin of nations be traced; and the very names of the most ancient of these, either unaltered or resumed after having been changed, confirm the veracity of those venerable records. Whenever any people claim an antiquity unwarranted by the Mosaic narrative, they have recourse to imaginary or allegorical personages, to gods or demi-gods. The race of pure mortals is every where restricted within very narrow limits. The thinness of population in the most ancient countries of which we have any account, as we ascend upwards from 15 centuries before the Christian era, contrasted with its rapidly progressive increase in those same countries below that period, demonstrates that the date of their first being inhabited cannot be very ancient. The tardy occupation and civilization of no less fertile and very contiguous countries, so late or later than twelve hundred years before Christ, shew that mankind

was

was not even then sufficiently numerous to spread itself over half the earth, and that this renovated race cannot probably date so high as Mr. Bailly has fixed. It appears that this author's famous Indian era of 3101 years before Christ was probably framed on retrograde calculations, and not on real observations. Several other fictitious anterior eras were avowedly so determined. The superstitious ideas of judicial astrology, fixing all great sublunary events to certain positions and conjunctions of the heavenly bodies, evidently prompted these laborious retrograde calculations. No stress can therefore be laid on these pretended astronomical observations to raise either the antiquity of the Indians or of the postdiluvian race beyond a period which may be much more reasonably fixed by the Mosaic chronology. Considerable variations in this chronology result from the three different versions of Genesis; and I have ventured to offer some observations which may, perhaps, determine the era of the deluge with the greatest probability to a middle term, which places it about 2698 years before Christ.

According to the Hebrew chronology of the antediluvian world, which is a medium between that of the Samaritan and that of the Septuagint, mankind had subsisted above 1650 years before the deluge. The space is sufficiently long for discoveries and improvements in science. That first race of men from longevity had peculiar advantages for the study of astronomy, and it was necessarily the institutor of the succeeding race. Noah and his children saved from the

deluge at an advanced age or in full manhood, would probably retain some part of its sciences. These, on the separation of mankind, were lost or nearly obliterated amongst several tribes during their long wanderings and repeated emigrations; and even amongst the most sedentary and fortunate nations, forced by the new state of things to attend above all to their subsistence and security, remnants only, and general practical rules without principles of the more abstruse sciences, were preserved. The antediluvian race is then that learned nation which Mr. Bailly wishes to discover, and to it belong those relics of former science still retained amongst the eastern nations, the source and origin of which he elsewhere seeks in vain. The year of 360 days every where prevailing in the earliest times, and the Indian mode of calculation, seem concurrently to point out a real difference between the antediluvian and postdiluvian years.

The result then of our historical investigations is, that there has been an universal deluge which almost destroyed the former race of men, and that its date cannot be removed beyond 3500 years before Christ, but that it is probably much less ancient; and finally, that the Mosaical account is the only one on which any reliance can be had relative to all facts preceding the 15th century before that era.

We have next, Sir, considered the validity of the so often repeated pretension, that the more unerring testimonies of nature attest a much greater antiquity not only of the world, but a much

more ancient date to any great revolution on the surface of the globe than can be warranted by the narration of Moses, from thence triumphantly rejected as spurious. For this purpose, we have minutely examined the celebrated system of Mr. de Buffon, and cursorily reviewed the opinions of several other modern philosophers, holding forth the indisputable evidences of nature as unanswerable proofs, that the account given by that legislator of the creation was purely framed to suit the understandings of a gross and ignorant people, but can in no wise be looked up to as a philosophic guide.

In this review, I think I have shewn that the doctrines of these pretended infallible interpreters of nature are sometimes in direct contradiction with her best-known fundamental laws, and that their theories are frequently supported on disputable and often false views of her processes, from whence groundless and unlogical conclusions are drawn. Frequently in contradiction with themselves, they are almost ever in opposition to one another, though all equally pretending to infallibility. Whatever then may be thought of the Moisaical system, it appears that no other has yet been produced which can claim from the philosopher a decided preference.

I think I have sufficiently shewn, from the very nature of stony matters, which Mr. de Buffon alledges in favour of his system, that the most general formation of these substances could not have been by

fire, but by or under water. He himself is forced to recur to an unnecessary second formation by water. I have agreed with that author and many others, that visible traces of the operation of fire are discernible on most parts of the earth, and on many where earthquakes and volcanos are now unusual and unrecorded in history: but I have maintained, that these appearances are no proofs of the whole earth ever having been in a state of fusion. The frequent explosions of subterraneous fires in all parts of the globe were the natural consequences of the entire subversion and dislocation of its exterior coat, in the first moments of a great convulsion, which both natural and historical testimonies shew us that this planet has experienced since its first formation. The universality and frequency of these explosions were probably continued for several ages after it, till the final settlement of the earth, and further prolonged by the presence of many great bodies of water which, though now disappeared, continued to sojourn on several parts of its surface to a still later period. I have proved by facts, that the date of eruptions cannot be computed by the number or variety of beds of lava existing in any one spot, nor can they be necessarily referred to an undefined antiquity because unrecorded in countries where, for many centuries after the most recently supposed date of the deluge, the inhabitants, if any, were in a state of barbarism, and incapable of handing down to posterity the events of their times. Even in more civilized regions, where such accidents of nature are yet frequent, what notices we have of them in remote ages are scanty and casual.

I have laid before you, Sir, the discordant opinions of several philosophers on the important, but yet undetermined and perhaps for ever indeterminable, question of the nature of light, heat and fire. The causes of the atmospheric cold in the higher regions of the air, and of the strong influence of the solar rays on animal bodies whilst the earth and air remain frigid—circumstances not peculiar to great elevations, but also experienced in a slighter degree in the plains of hot countries during the prevalence of the cold winds—naturally found their place under this head. Without pretending to decide, with Messieurs Wallerius and de Luc, that the sun is not a fiery body, or that its rays have no intrinsic heat, I have inclined to the opinion, that the chief effect of those rays on all bodies are derived more from them as agents exciting and putting in motion by their attraction congenial particles existing in those bodies, than from any communication of superadded heat.

In the following Letters I have given an abstract of the opinions of Mr. Wallerius, and have followed them by my own founded on the same principles, explaining the gradual progress of creation from the first chaotic mass, delineated in Genesis, by the successive application of the fundamental laws of nature, severally impressed and beginning to operate at the distinct commands of the Creator. In the course of our observations on the formation of this earth, I think we have made it appear, that the Mosaical account of the creation is not only not repugnant to the laws of nature, but is probably in every point

point explicable by them, without giving any forced latitude to the concise expressions of that author, who aimed not to instruct philosophers, but to deliver truths in the most simple manner. It has been shewn, that several expressions which have been looked upon as made use of in pure conformity to vulgar ideas are not only possibly but probably exact in their most literal sense. If in the discussion of so many difficult points we have sometimes been mistaken, if in some details we have erred, we have at least, in my apprehension, pointed out the road, by following of which more fortunate or more consummate philosophers may at length clear from obscurity that venerable history of the first existence of nature, and thence possibly be enabled to discover many of her yet seemingly impenetrable arcana. In conjunction with Messieurs Wallerius, de Luc, and Whitehurst, I have pointed out a state and aspect of the antediluvian world very different to that which now exists.

A general deluge which must have greatly altered this former state, whatever it was, is confirmed beyond all reasonable probability of doubt, both by the consentaneous traditions of all nations, and by the present dislocated aspect of the surface of the earth, and the visible effects of water every where apparent. The cause of that deluge must have been both great and universal. The primary one, no doubt, was the all efficient will of the Supreme Being. To this, in punishment of the crimes of man, it is assigned by all ancient traditions. But as God generally employs secondary intermediate means, it is both

both lawful and becoming philosophy to enquire into the immediate cause capable of producing such great effects. Whether the pressure of a comet broke up, or the violent explosions of subterraneous fires shook and rent the outward frame of the globe, is uncertain and conjectural; but with Messieurs Wallerius, de Luc, and Whitehurst, I trust I have made it probable, that the centre of gravity of this planet was changed by that convulsion which was capable of inundating the whole surface; and indeed no other means seem adequate to that effect. A change of centre of gravity from the centre of the globe itself nearer to one of its poles would necessarily diverge the axis, and this would naturally not only alter the constitution, but the course of this planet in the heavens. The present great inclination of its axis seems neither consonant, as the best possible position, to the primitive designs of the beneficent Creator, nor analogous, as far as we know, to that of other planets; and hence reason alone may suggest that it was not original. If at any time, agreeable to the universally received tradition of mankind, the Divinity purposed in his wrath to render the former constitution of this earth less propitious, it seems not improbable to have been effected by such a change. The most obvious means of altering the centre of gravity appears to be a partial compression and more intimate consolidation of some part of the earth. The aspect of the southern hemisphere, so sunken as to have become one general shallow sea, strongly favours the supposition that it was by the internal consolidation of this part of the globe that the centre of gravity was removed
nearer

nearer to the southern pole. This could not be effected without the almost total dislocation of the exterior surface of the earth, which must consequently produce a general deluge. Its present both exterior and to great depths interior structure plainly indicates such almost universal dislocation to have happened. Such extended ruin must have been effected by the agency of a very great interior cause, and it is not difficult to assign one. Supported by the authority of the above-named philosophers, I have offered a probable explication, by the breaking down of interior caverns more generally and more completely towards the southern pole. The entire failure of the great vaults which covered these subterraneous cavities, and their immediate filling with compact and heavy matter towards this pole, account for the change of centre of gravity, and for immense tracts being there sunken into shallow seas. The much less complete and more unequal rupture of many vaults in the northern hemisphere, by the partial depression of great portions of land and the proportional elevation of others, has occasioned deep seas and great extents of high and variously broken continents in all that circumference. In this great convulsion, it mattered not whether those former tracts were originally lands or seas: as circumstances commanded, those were sunk into fathomless waters, and these were elevated into rugged mountains. The general position of ancient lands and seas was changed, but the most central parts of the present continents would suffer the least alteration. The visible rents, fractures, and fissures of high coasts and of mountainous countries, and the frequently inclined

inclined position of the various strata which compose them, sloping from their highest summits and dipping into the earth to the greatest depths in the same direction and in the same order, strongly evince that such a rupture of the exterior coat has at some period taken place, and that few parts of the surface now remain in their natural and primitive level. This is further proved by the interior grain and structure of many stony matters which never could have been deposited, concreted, or crystallized in their actual position. If the exterior or interior structure of some mountains cannot be accorded with this origin, or ascribed to this first convulsion, the impetuous retreat of the waters of the deluge, the irruption of former seas, or the frequency of volcanic explosions during some centuries, amply account for their different aggregations. These first great derangements, and the variety of climates introduced by the altered level of the surface, and by the new and sudden inclination of the axis, give sufficient reason for many important phenomena which strike us in the present composition of the earth, and have given it a constitution very dissimilar from that which previously obtained ; a change of which the confused memory has been handed down to us by the primitive traditions of all nations.

Natural indications concurrently with several antient traditions make it highly probable that the subsiding waters of the deluge, uncovering a quantity of land more than sufficient for the paucity of its then inhabitants, left after their first retreat numerous interior
seas

seas and lakes suspended far above the level of the present ocean, though many of them are long since run off and become gulphs of the sea or dry lands in the midst of the continents. The breaking down of the mounds which for a time upheld them at various periods, perhaps during several centuries after the deluge, must have naturally caused new and important ravages on the surface of the earth. These may well account for many secondary accumulations and excavations, and, conjointly with the former great convulsion, for all that variety of animal or vegetable deposits found on the surface or contained within the bowels of the earth.

The at one period very remarkable and afterwards gradual decay of the human constitution, and the consequent abridgement of the age of man, I have conjectured to have proceeded in the first instance from a subsequent depression of the level of the ocean, which sunk not to its present depth till the days of Phaleg; and in the following ages to the successive disappearance or diminution of those great interior seas and lakes, which during their existence greatly tempered the climates of the whole earth. From the moment these final changes, very naturally from the then state of mankind unrecorded in history, took place, and not before, the present extremes and frequent vicissitudes of heat and cold were felt, and had their full influence on the human frame; and this seems not to have been completed till after the age of Moses, 1500 years before Christ. This idea is indeed hypothetical, but it will perhaps be allowed to

give a probable cause for the decrease of the age of man to the moment of its being reduced to the present standard.

As the reunion of causes and effects attendant on or subsequent to the deluge is sufficient to account for all the changes which have happened either to man or to the earth which he inhabits, without recurring to an antiquity unwarranted by scripture chronology; and which with respect to postdiluvian times stands limited by every concurring evidence which the nature of things admits; it is clearly as useless as contrary to sound reason to have recourse, with Mr. de Buffon, to an imaginary original formation requiring the successive operation of ages, or to a slow deperdition of terrestrial heat; or, with some other philosophers, to a gradual change of lands and seas by the supposed constant invasion and desertion of the ocean. The experience of the last 2000 years belies the former assertion; and the second, should even the pretended motion of the sea be certain, is mathematically impossible.

If after so many celebrated philosophers I have dared to hazard my ideas, grounded on the text of the first and most venerable of historians, and supported by some authors of high authority; if I have in the course of my investigations stated my opinion on other mysteries of nature; I give them not but as conjectures which appear to me to wear the best semblance of truth. Should they excite so much of the attention of men of greater abilities as to bring forth
more

more luminous explications, my feeble efforts would be amply rewarded by their success. On such difficult points the wisest cannot hope to reunite all suffrages. If the features of nature may serve to point out her revolutions or to discover her age, the state of mankind at different eras, and the traces they have left, are not to be neglected. It is from the reunion and confrontation of these testimonies that this cause must be judged. Notwithstanding his deference to the decisions of Mr. de Buffon, Mr. Bailly felt the truth of this, and strove to reconcile antique traditions with his theory. To such who are possessed of all the necessary talents and variety of knowledge required, I would propose a few questions to be decided by the simple light of reason.

Is it necessary that all those laws of nature, whose reunion seems requisite to preserve the balance of nature complete, should have all been simultaneously impressed and active in the moment of formation?

Is it possible to explain the successive order of creation described in Genesis by the successive application of some of the fundamental laws of nature as severally taking place and becoming active at the distinct commands of the Creator?

Do the actual processes of nature and those which chemistry develops imply the necessity of a long succession of ages for the first

deposition, concretion, or crystallization of the several substances of which the earth is composed?

Do the monuments of nature concur with the testimonies of history, in establishing the reality of a great convulsion and of a general deluge? Does the actual structure of the earth necessitate more than one such revolution?

Should even more than one have happened, is the last to be referred to an indefinite antiquity, or must its date be limited within a few centuries more or less of the time I have assigned?

Can or cannot the present disordered state of the earth, and the various phenomena which present themselves both on its surface and in its bowels, be reasonably attributed to this convulsion, or to its consequent effects?

The sketch which I have attempted may possibly convince some persons, but it will not have the authority or the precision which others may exact. If a more able hand could fix the ideas of philosophers by a clear decision of the above questions, not indeed beyond dispute, for that is impossible, but beyond all reasonable doubt, we should have certainly advanced one important step. If the result was unfavourable to the general ideas I have advanced, the field will remain open to every bold speculation. But if the conclusion to be deduced

deduced from plain reason was such as it appears to me, the wandering genius of future philosophers will be restrained, and their heated imaginations will no longer deviate into infinite space. The sublime study of nature, not damped but confined within reasonable limits, would be more usefully directed to the amassing a series of real facts, and to making from them such deductions as may be warranted by fair logic. The romance of philosophy would disappear ; but the history of its real acquisitions would advance by slow but certain progresses.

If my feeble efforts have been able to make you, Sir, perceive that it is not impossible to conciliate the present formation and apparent changes which have happened to this globe with the short duration generally allotted to it, I shall have fulfilled my aim. Where I have only been able to throw some scattered lights, others more deeply read in the history of nature and of man may be competent to carry the full blaze of conviction. The uncertainty of human reason, by some too fondly held up as an unerring guide, will still however render every decision controvertible. That reason limited, but truly sublime when not blinded by passion, has unfortunately as many shades as the countenances of men. It is not always with great genius or talents she resides ; they have frequently exhibited the example of the most eccentric wanderings : but it is ever with the sober few that she takes refuge. To her meditations nature presents the most unbounded and most magnificent spectacle. Let us dare to investigate

gate her wonders : but let us still be diffident of an heated imagination which may hurry us beyond the limits which are assigned to the powers of man, and let us not too far flatter ourselves to penetrate by the sole help of reason into the full secrets of her origin. Nothing is too daring, says Horace (*a*), for the aspiring mind of man ; but it is when it overleaps its prescribed circle that its weakness becomes most manifest. No opinion so absurd, no folly so extravagant, as not to have been at some time adopted by men of otherwise superior parts. The Supreme Being has wisely guarded the great principles of morality by an instinctive sense (*b*) of right and wrong (*c*), which the most impious and most licentious doctrines have never been able totally to pervert in the great body of mankind : but he has abandoned the nature of this world to the disputes of the learned —“ *Mundum autem tradidit disputationi eorum ;*” and it is not in our days that these will terminate.

NOTES AND ILLUSTRATIONS

TO

LETTER IX.

(a) Page 598.

Nil mortalibus arduum est,
Cælum ipsum petimus stultitiâ.—HOR. l. i. od. 3.

WE may remark some precious relics of ancient traditions in this same ode. The sons of Japhet, father of the northern and western world, from whom the Greeks and European nations are derived, first steal fire from heaven :

Audax Japeti genus
Ignem fraude malâ gentibus intulit.

It was the wrath of heaven which abridged the life of man, and death heretofore tardy hastened his steps.

Semotique prius tarda necessitas
Lethi, corripuit gradum.

(b) Page 598.

Many metaphysicians agree in scouting an innate moral sense as well as innate ideas. They cannot deny an instinct to the brute creation ; why
refuse

refuse it entirely to man? It is the real guide of the former, but, susceptible both of amelioration and in some degree of deviation by education, why should it not be allowed as an impulse to the other? Irrational animals follow it unerringly if left to themselves. The pursuit of hares and foxes is the natural instinct of hounds; but, though naturally afraid of man, they may be taught to follow and relish his blood in preference. To man instinct can only be a first impulse, which his own reason or his bias to imitation may change or warp. By some it is contended, that there can be no innate moral sense, because whole nations have been found to adopt as meritorious, actions which others universally condemn. To such I shall suggest the following remarks. It is generally deemed piety to cherish our aged parents, whilst in some countries it is piety to put an end to their existence. But this last proceeds from the same general instinct of gratitude, which some nations think best answered, by terminating at once a life which has already or will shortly become burdensome to the possessor. We reason the same with respect to aged or diseased horses or dogs. No savage yet thought it right to put to death the benefactor who had just saved his life, at least if not a declared enemy to his tribe. Should it happen in the latter case, it can only be because his acquired or political reason has got the better of his natural impulse. On this ground it was that Virginus sacrificed his innocent daughter to family honour or to the public good.

In my opinion, what is called the conscience of man is ever just and upright, when not debased by brutal ignorance, or warped by national or private interests and passions. In some desolate and frozen climates, the savage, stupidly insensible to every thing that relates not to the means of subsistence or to the grossest gratifications, has very few ideas beyond those appetites which sway the brute creation. In more advanced societies, right or wrong, rigidly adhered to within themselves, is circumscribed within the narrow walk of the particular tribe or community. In the most polished nations, prejudices and habits originating in the interests of the ruling part or in mistaken ideas of religion not only obscure the idea, but convert crimes

crimes into heroic virtues. In Indostan, women, though possibly cherishing little or no real affection for their tyrant husbands, were and are still taught that it is dishonourable not to burn themselves alive in the prime of youth on the funeral pile of a deceased lord, though old, infirm, or churlish in his lifetime. This probably originated not so much in superstition, as in the policy of men having many wives to guard their own safety from jealousy and disappointment, and to secure the fidelity of females looked upon as subservient property. In other nations, it was in like manner customary to bury with their chiefs and heroes, arms, horses, slaves, and sometimes favourite courtiers. The notion inculcated was to serve them in another world; but the most probable original motive was to secure the fidelity of those more immediately about them in the present.

In individuals conscience is frequently clouded and sometimes totally perverted by interest and passion. Subtle sophists these, they are ever at hand to gloss over and give a favourable colouring to whatever may at first alarm it. The tyrant or usurper who sacrifices thousands to his ambition veils, even to himself, his crimes under some specious pretexts: his talents will confer glory and prosperity on nations, and vanity suggests that he alone is worthy to command. The appetites or pleasures he indulges in are well-earned relaxations from care and solicitude, and habit makes them necessary. In inferior stations, the means of advancing, however vicious, become justified by general practice. Gradually enfeebled conscience scarcely startles at crimes of deeper hue; till it at last becomes dormant, and wakens not but to give from time to time some transitory stings of remorse, soon repelled by the more vigorous habits of vice.

The pride of genius, of science, or of wit, is perhaps no less an enemy to conscience than the more impetuous passions. Philosophic pride has aimed to drag the godhead from his throne, has broken down those barriers which conscience yet upheld, and equalized vice and virtue. Elated by either really superior, or not unfrequently by imaginary talents, the new Titans of the

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age affix the stigma of imbecility on all who dare not equally with them ; and every witling, borrowing a few of their phrases, fancies himself a philosopher ; even females enter the lists as champions of infidelity :—but of philosophy as of poetry, we may say with Pope,

A little learning is a dangerous thing :
Drink deep, or taste not the Pierian spring.

To the passions of this motley crowd, however individually contemptible, their sage legislators address themselves in every shape and form, and in return receive new incense and celebrity. What enormities their principles diffused amongst the multitude are capable of producing, the example of a neighbouring nation has sufficiently evinced. May it at least be a lasting warning to posterity !

ERRATA.

Page	18	Line	10	— with, Judea, <i>read</i> with Judea,
—	22	—	7	— p. 24, l. 10 & 13.—p. 56, l. 23. — 3102 <i>read</i> 3101
—	24	—	10	— 3502 <i>read</i> 3501
—	34	—		last line, Heraclides, <i>read</i> Heraclidæ
—	36	—	6	— cotemporaries, <i>read</i> contemporaries
—	63	—	5	— successors; dele;
—	71	—	12	— Sethura, <i>read</i> Ketura
—	89	—	9	— Ægialaus, <i>read</i> Ægialeus
—	120	—	1	— Mechecan, <i>read</i> Mechoacan
—	138	—	29	— p. 217, l. 6.—p. 240, l. 14.—p. 251, l. 7 & 14.—p. 339, l. 11. Gengis-khan, <i>read</i> Jenghiz-Khan
—	149	—	6	— p. 150, l. 19.—p. 151, l. 29.—p. 152, l. 24.—p. 292, l. 14.— — p. 293, l. 12 & 24.—p. 357, l. 4.—p. 358, l. 10, 18, & 24.— — p. 374, l. 14.—p. 384, last line — deposits, <i>read</i> deposites
—	153	—	20	— deposit, <i>read</i> deposit
—	158	—	17	— Mr. Count, <i>read</i> Mr. Court
—	165	—	16	— the same, <i>read</i> that same
—	180	—	11	— Belgium. <i>read</i> Belgium, and line 12, Britain, <i>read</i> Britain.
—	200	—	19	— cotemporaries, <i>read</i> contemporaries
—	288	—	24	— these planets, <i>read</i> their planets
—	314	—	5	— 6, & 15.—p. 326, l. 1.—p. 329, l. 16.—p. 374, l. 7, vitrifiable, <i>read</i> vitrificable
—	318	—	10	— menstruums, <i>read</i> menstrua.
—	369	—	22	— though now, <i>add</i> unusual
—	397	—	23	— Fero <i>read</i> Ferro
—	399	—	25	— Catherine <i>read</i> Catharine
—	401	—	27	— Atalantis <i>read</i> Atlantis
—	509	—	8	— who, <i>read</i> whole
			13	— carcase, <i>read</i> carcass
—	579	—	24	— Pacific antarctic, <i>read</i> Pacific and antarctic

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